TEKNILLINEN KORKEAKOULU
Sähkö- ja tietoliikennetekniikan osasto

Toni Saikkonen

Analysis of Electronic Payment Systems for Network Gaming

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HELSINKI UNIVERSITY OF TECHNOLOGY **ABSTRACT OF THE MASTER'S THESIS**

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The research problem investigated in this paper centers around an analysis of different electronic payments methods used in network gaming in order to better understand the cost structures, pricing principles, buying behaviours and their inter-relation to the relevant cultural context. This is an important issue when trying to understand the dynamics of micro and macro level payment methods commonly used in online services.

A strategic payment method and system evaluation framework was developed to provide a good ground theory and strategic tool for improving payment systems for the needs of online network gaming environments. These frameworks applicability to practice was analyzed by using selected country case studies.

The future of electronic network gaming payment systems will be more heavily divided into three categories: Telecom payments, online payments and offline payments. Online payments with credit card's huge global coverage will still play a major role, but other variations are coming fast.

Keywords: Payment method, payment system, online payment, network gaming, micro payment, telecom payment

TEKNILLINEN KORKEAKOULU **DIPLOMITYÖN TIIVISTELMÄ**

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Tutkimuksen ongelmana tässä tutkimuksessa oli analysoida erillaisia maksu metodeita joita käytetään verkkopeleissä jotta saataisiin parempi käsitys kulurakenteista, hinnoittelun periaatteista, ostokäyttäytymisestä ja niiden ristikkäisestä suhteesta ympäröivään kulturelliseen ympäristöön. Tämä on tärkeä asia jotta ymmärretään online palveluiden micro ja macro tasojen maksu metodien dynamikkaa.

Teoreettinen maksumenetelmien sekä järjestelmien arviointiin käytettävä malli kehitettiin luomaan strateginen perus malli ja työkalu maksujärjestelmien parantamiseen online verkkopeli ympäristössä. Mallin soveltuvuus käytäntöön analysoitiin käyttämällä hyväksi valittuja tapahtuma tutkimuksia.

Elektronisten verkkopelien maksujärjestelmien tulevaisuus tulee entistä enemmän jakaantumaan kolmeen pää kategoriaan: Telecom maksut, online maksut ja myös offline maksut. Globaaleihin luottokortteihin perustuvat online maksumenetelmät tulevat edelleen merkittävässä roolissa mutta myös muunlaiset menetelmät ovat nousemassa suureen suosioon käyttäjien keskuudessa.

Avainsanat: Maksumenetelmät, maksujärjestelmät, online maksaminen, verkko pelit, micro maksaminen, telecom maksaminen

Preface

I would like to thank my instructors Hanna Rajatora and Marko Orenius for discussions and insightful comments about payment systems in general and the theoretical foundations of this work. Warm thanks also to the other people at Sulake Corporation, especially Kenneth LeDrew, for valuable legal advice as well as many good questions and helpful comments about the payment system evaluation framework developed there. Special thanks to Osma Ahvenlampi, who had the patience to read through several drafts of this paper. He also served as an invaluable discussion partner when there was a problem in hand. Thanks also to the other people who read and commented on the work, and most importantly, warm thanks to my supervisor Heikki Hämmäinen.

The work described in this thesis was supported by Sulake Corporation Oy.

Espoo, 12th of September, 2005

Toni Saikkonen

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List of Abbreviations

MT Type of SMS billing where mobile terminated message is billed from the user.

MO Type of SMS billing where mobile originated message is billed from the user.

SSL Socket Secure Layer is used in Internet traffic to provide secure transactions via public network.

IVR Interactive Voice Response is a common name for different kind of landline phone services and systems also used for billing purposes.

1 Introduction

1.1 Background

The internet has narrowed the barriers between the publishing, printing, multimedia, radio, TV and telecommunication industries. This change has created a new sub form of content business, namely, the digital content business. The digital content business refers to creating content for new technical devices.

To make the digital content business profitable for content providers, electronic payment systems are needed for collecting fees from end users. One of the main characteristics of these payments is that a single transaction is usually no more than 10 Euros. These small value transactions are commonly referred to as "micro payments".

This is a problematic aspect of the digital content business encountered by traditional payment systems as the share from the actual payment going to parties other than the digital content provider itself can be enormous. That is why these digital content providers are constantly seeking cost-effective solutions for timely and low-risk processing of high-volume, time-sensitive transactions.

1.2 Research Problem

There have been several attempts to launch alternative currencies and payment methods for small online transactions during the last 10 years. Interestingly, no industry leader has emerged to date. One of the leading industries attempting to find a cost effective solution to this dilemma is the gaming industry. The market potential of highly profitable network games with thousands of simultaneous users is tremendous, if the total costs of electronic transactions can be lowered. This is the primary reason why this study focuses on the network gaming business.

The research problem investigated in this paper centers around an analysis of different electronic payments methods used in network gaming in order to better understand the cost structures, pricing principles, buying behaviors and their inter-relation to the relevant cultural context. It is hoped that this analysis will provide a good ground theory and strategic framework for improving payment systems in network gaming and creating new business models around it.

1.3 Objectives of the Research

This study answers the following questions:

1. *What types of business roles can be identified in payment systems and how can they be mapped to technical payment architectures?*
2. *What types of cost structures and value networks exists in payment systems?*
3. *What kind of methodology can be used to evaluate and find an optimal payment system?*
4. *What are the main trends for the future of electronic payment systems?*

1.4 Research Scope

This study is mainly outlined to focus on business structures, payment models and their evaluation. Also included will be an investigation of the relevant cultural and legal issues. Payment transaction tracking systems and the usability issues of payment systems will be omitted from this research.

1.5 Research Methods

This study is done mainly through analysing an existing business case, namely, the Habbo Hotel -network game. The game will be analysed first by comparing some Habbo Hotels in a country specific context and then introducing a new payment system for a specific country. Materials for the case study are collected from expert interviews and actual statistics available which contain information about payment culture, payment architectures, cost structures, pricing models, legal issues and other restrictions. The applied background theory is collected from literature, newspapers, Internet and other available sources.

1.6 Study Structure

The focus of the first part, chapters 2-5, is to provide theoretical frameworks and models for understanding the history, cultural differences and what kind of business roles and basic payment architectures exist in electronic payment systems. The second part, chapters 6-9, of the study provides a Habbo Hotel - network game case study, first introducing a theoretical framework for payment system evaluation and then going deeper into specific country cases to see how well this framework applies to the real world. The third part, chapter 10, is devoted to discussion based on theory and real cases. The final part, chapter 11, summarizes this study and points out the most important results and further study recommendations.

2 Brief History of Electronic Payments

Business-centred electronic commerce began more than two decades ago with the introduction of electronic data interchange (EDI) between firms. From the beginning of the late 70's, an impressive number of innovative electronic payment systems have been developed and tested commercially. However, the resulting variety and complexity of the systems has become one of the obstacles to the broad acceptance of electronic payments. Thus, solely for the Internet, more than 100 payment methods are available, some of which are still being used commercially.

The shift from physical to virtual payments has brought enormous benefits to consumers and merchants. Simultaneously, it has put extra pressure on payment service providers, including banks, card companies, and mobile operators to provide robust security and interoperability. The advent of mobile payments has added another layer of complexity through the use of constrained devices with different capabilities and network limitations.

2.1 The Concept of Digital Wallets

The digital wallet concept is relevant to many of the past and present digital payment systems. It seeks to emulate the functionality of the traditional wallet. It stores value and provides a secure payment process from consumer to merchant.

The earliest electronic payment systems in 1970 were simple Smart Card solutions. A Smart Card is a stored value system based on cards that have embedded chips or magnetic stripes capable of storing value and other required information to facilitate transactions. Today, all kinds of Smart Cards exist, disposable and reusable. Most advanced ones can operate even without physical contact ("contactless").

Later on, the internet made similar systems possible for online use. In online stored value systems, accounts are created by depositing funds into an account by using for example debit cards, gift certificates, prepaid cards, cash, mobile phone or smart cards. This permits consumers to make instant, online payments to merchants and other individuals based on value stored in an online account.

2.2 The History of Online Internet Payments

The World Wide Web was introduced in 1991. The earliest electronic payment systems for purely Internet were known as "digital cash" and were publicly introduced in 1995. They were developed for a different kind of value storage and exchange purposes that have limited convertibility into other forms of value. These systems usually required intermediaries to convert value. Nowadays many early examples such as FirstVirtual, Cybercoin, Millicent, Digicash, Internet Dollar, Pay2See, MicroMint and Cybercent have disappeared mostly due to low utilization.[1]

Banks have been building digital home banking systems since the mid 80's. In Finland, the first network to provide publicly available digital banking was Telesampo in 1984.[2] The first web based home banking solutions were introduced in 1995. Today in Finland the most popular online payment method is direct money transferring via a home banking system.

Credit cards have become the dominant form of online payments globally since the existence of a common online credit card system and SSL in 1997. For example, in USA and Canada around 80% of online payments were made with credit cards in 2002.[3] The success factors behind this are due to credit cards being familiar, easy to use and the most widely accepted method because of low merchant costs even if the risk of misuse is considerable.

For some countries, like USA, one other important electronic payment system is digital check. Digital checks extend the functionality of existing checking accounts for use as online shopping payment tools with lower costs. Based on Forrester research circa 2004, roughly one-third of U.S consumers choose to pay exclusively via their checking account if given the option.[4] Today there are a variety of service providers in the market, for example eCheck, MoneyZap, CheckFree, NetCheque and VeriSign.

The latest trend in the development of online Internet payments is peer-to-peer payment systems. These P2P payment systems are mainly designed for individuals and small merchants and employ existing credit card and checking payment systems with email or

[1] Shirky, 2003
[2] Diditoday, 2004
[3] The State University Of New Jersey, 2004
[4] ContentBiz, 2003

instant messenger software. The biggest player in P2P payment systems, PayPal (founded in 1998), has become one of e-commerce's major success stories, despite suffering from relatively high levels of fraud. Other big players include Western Union (MoneyZap), AOL (AOLQuickcash) and Citibank (C2it).

2.3 The History of Telecom Payments

Since the late 80's, the traditional telecom payment method has been Interactive Voice Response (IVR). IVR is still applicable for many payment systems. However, since the late 90's development has headed towards mobile payment systems.

Mobile commerce is developing at different rates and in different directions depending on the region. The European market, with its high mobile penetration is currently developing along SMS lines. In the Far East the technology has already gone a few steps further towards wireless enabled or contactless transactions.

These systems can be based on extra smartcard, software or both added to phone. For example, Japanese operator NTT-DoCoMo introduced in 2004 a contactless electronic wallet for physical goods integrated into cell phones. It provides both prepaid and post paid models and enables customers to purchase goods, pay by debit or credit card or by charging the transaction to their phone bills.[5]

One of the main problems in telecom payments over SMS has been the lack of co-operation between operators. To further enhance co-operation, Orange, T-Mobile, Vodafone and Telefónica Móviles introduced a new payment system called Simpay in 2004. The Simpay network promises to create an international payment system specifically designed for charging things to a mobile bill whether they are bought online from your phone, on the internet or in a physical shop. Below is a table, showing some telecom payment systems developed recently in Finland.

[5] American Bankers Online, 2004

Table 1: The development of Finland's telecom payment systems[6]

Year	New innovation	Billing method
1997	Buying product from a vending machine by making phone call (IVR)	Billed with phone bill
1998	Buying product from a vending machine by sending SMS	Billed with phone bill
2000	Open a pre-paid account to a client and payments managed via SMS	Paid in advance to stored value account
2002	Integrate payment management via SMS to Credit Cards	Billed with credit card bill
2002	Integrate payment management via SMS to Bank accounts' mobile purse	Paid in advance to stored value account
2002-	Dual chip mobile phones	Different methods

Mobile payment systems are currently not well established in the U.S. This appears to be changing with the growth in Wi-Fi and 3G cellular phone systems. However, in the US telecom payments, methods and billing systems still vary dramatically across operator networks.

2.4 Summary

During the last 30 years electronic payment systems have evolved in many different directions. Scientists over the world are continuously trying to use the latest technology to provide better electronic payment systems. History has proven how problematic the concept of high volume electronic micro payments can be.

[6] Liikenne- ja viestintäministeriö, 2003

3 Payment Cultures

This chapter gives a deeper look into cultural variation among different payment system usages. In a global perspective, payment cultures differ greatly, but some trends can be identified to understand the dynamics behind these differences.

All countries can be divided into 3 different groups if it is a case of big money transactions like wages. These are so called "giro countries", "cheque countries" and "cash countries". According to this widely used classification, none of the EU countries is "cash oriented" any longer as they may have been in the past or as Asian economies currently still are. In all retail money transfers, payment cards play a very important role in that. Credit transfers (giro), payment cards and cheques are the most important payment instruments for retail payments in the EU.[7] Also direct debit contracts are very popular in many countries when buying continuous services. The use of the different instruments varies substantially from country to country.

One important factor for the diffusion of payment systems is the degree of cooperation between banks. This is particularly so regarding clearing payments between parties possessing accounts at different banks and involves such matters as electronic purses and the interoperability of payment systems. This currently seems to be greatest in France, Italy and Germany, while most relationships between banks in the Nordic countries are on a bilateral basis, albeit based on multilaterally agreed standards and common processes.

3.1 Credit Transfers and Direct Debits

Credit transfers and direct debits are the most important payment instruments for cashless transactions in the EU. They account for 58% of transactions and 89% of the total value of transactions. For example in Norway, these two instruments accounted for 49% of transactions and 96% of the total value of transactions in 2000.[8] Credit transfers are an important instrument for the cashless transfer of large sums throughout the EU.

[7] European Commission Joint Research Centre, 1999
[8] Norges Bank, 2003

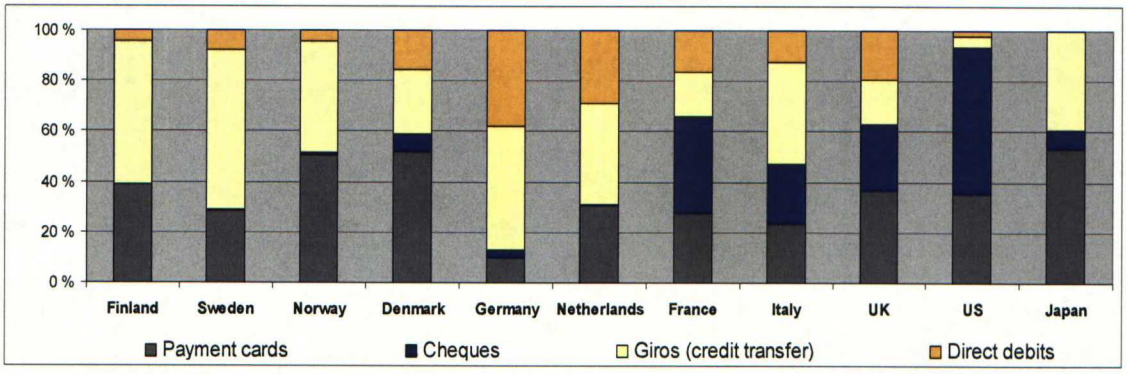

Figure 1: Instruments' % share of no. of non-cash transactions in selected countries (2000)[9]

Greater use of direct debits was made in the Netherlands and Germany. In France, credit transfers are regularly employed for large "macropayments" only, such as wages. Giro payments over the Internet are increasing rapidly but several countries lack the facilities for this type of payment. The Nordic countries are leaders in this area. The use of efficient, electronic payment instruments is more widespread in the Nordic countries than in other European countries.

3.2 Payment Cards

There has been a rapid increase in the number of point-of sale terminals in outlets and the use and spread of payment cards in the EU. In ten years this service has developed from being one of the least used to being the most widely used form of payment in some countries in the EU area. It would appear that payment cards are employed more frequently in countries with smoothly functioning debit card solutions than in countries where credit cards are primarily used. Below is a table showing differences among countries.

[9] Norges Bank, 2003

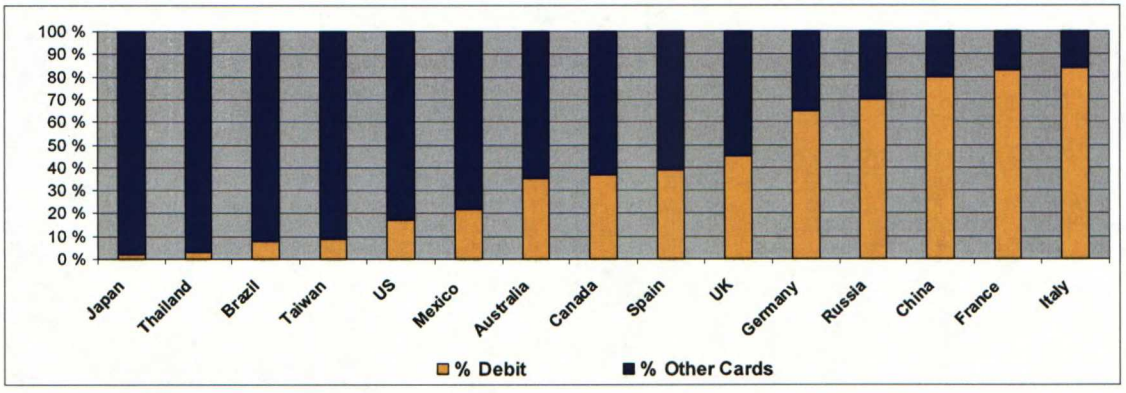

Figure 2: Debit card usage versus other cards in selected countries (2001)[10]

The importance of payment cards (debit and credit cards) is increasing in EU, although to varying degrees. For instance in France, such payment cards are challenging cheques. In the Netherlands and Germany, credit cards were in the past not widely used and accepted. In Germany, this was due to the widespread use of the Eurocheque card for many of the purposes for which credit cards can be used. A complete dominance of debit cards over credit cards continues to exist in Italy and France.

People in the Nordic countries tend to have fewer payment cards at their disposal but make more use of them for transactions which have a lower average value.[11] This indicates that cards are gaining acceptance as an everyday method of payment to the extent of becoming a substitute to cash for lower value payments. It might also indicate a concentration of card users on their preferred and usually established brands rather than experimenting with a variety of cards with overlapping functionality. Apparently this applies to France and the Nordic countries.

3.3 Cheques

Cheques and payment cards are alternatives to cash when settlement occurs at the point of sale. Cheques are used very little in Norway, Finland and Sweden, whereas in France, for example, cheques account for more than one out of three payments.[12] Generally speaking, it is relatively expensive for banks to offer cheque services. Therefore, the use of cheques is declining in most European countries.

[10] Visa, 2003
[11] European Commission Joint Research Centre, 1999
[12] Norges Bank, 2003

In many countries, the use of cheques is paper-based. Electronic cheques, which are similar to payment by giro over the Internet, do exist in some countries. In US and Canada cheques are still going strong. In France and the UK, cheques are still frequently used for payments. In Germany, the Netherlands and the Nordic countries the success of giro has replaced cheques.[13]

3.4 Online Payments

When examining the possibilities for Internet payments we have to deal with a large number of different approaches in and between the countries. The overall preferred payment instrument of choice, mainly for international purchases, is the credit card. There are different levels of security and the widely promoted SET-Standard has not yet taken off. Besides credit cards, other conventional payment methods are well suited for tangible goods in all countries. It is a matter of the specific payment culture, whether credit cards (as in Spain), or credit transfers and direct debits (as in Germany), cash on delivery (as in France) or credit and debit cards equally (as in the United Kingdom) are the most frequent payment means.

One possibility for paying on the Internet is credit transfers. Besides pure online or Internet banking systems, there are some systems where one can immediately initiate the credit transfer while purchasing goods on the Internet. Naturally these systems are backed by banks. Among these systems is the Finnish "electronic giro". Similar systems exist in Sweden.

Banks are the drivers behind "national electronic purse" systems for payment cards. One way to push electronic purses is to integrate them on well diffused payment cards, in most cases debit or cash cards. The German, Finnish, Swedish and Spanish systems are going the way of hybrid payment cards, while in Denmark and Italy they commonly deal with "stand alone" electronic purse cards. The hybrid approach is likely to show a great difference between cards issued and cards used. The different approaches to electronic purses in the European countries have to do with different payment cultures, regulation regimes and national frameworks.

[13] Norges Bank, 2003

Statistically 90-95% of US customers and 75-90 % of international customers have at least one suitable credit card for Internet purchase.[14] Nonetheless users often still desire different payment options. For example, of the 2.1 million subscribers of AmericanGreetings.com's, 18% choose to pay with paper checks and 7% choose to pay using eCheck although there is an additional service charge for both.[15] Across Europe, only two thirds of Internet consumers have credit cards and of those who do, only 36% are willing to use them online.[16]

3.5 Telecom Payments

In the EU, Germany, Italy and the UK are the largest markets for mobile services with 59.2, 53.5 and 50 million mobile phone users respectively.[17] Even if the markets are big, some cultural differences can be found. One of the main differences is how many users rely upon the prepaid model for mobile phone use. This may correlate with the degree to which mobile operators trust their user's capability of paying their phone bills. Of course, other established cultural business procedures, regulations and other legal issues impact this. Start-up operators usually enter the market with a prepaid billing model because of its lower fixed establishment costs for customer billing.

In Italy, 90% of users use the prepaid model. In Finland, however, operators are more willing to sell on credit and 90% of users use post paid model for paying mobile phone bills. Below is a table that illustrates differences.

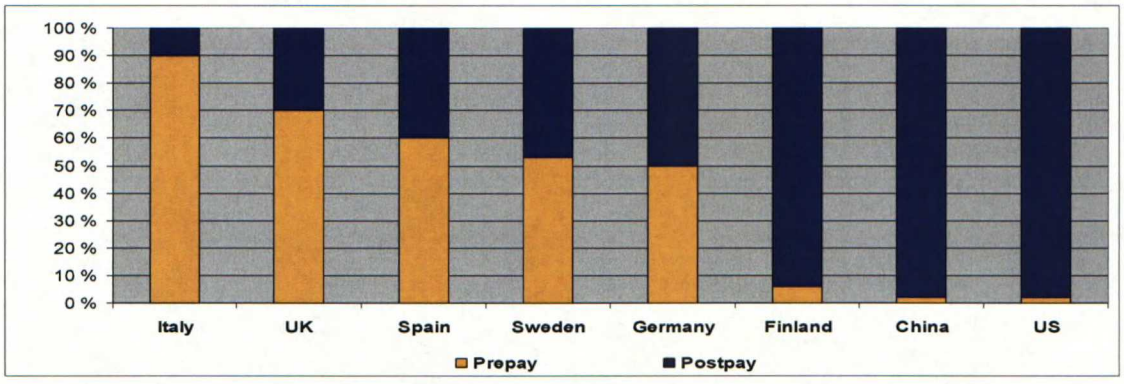

Figure 3: Share of mobile Prepaid/Postpaid usage in selected countries (2003)[18]

[14] CPSS - Red Book, 2003
[15] ContentBiz, 2003
[16] Forrester Research, 2002
[17] Netsize, 2004
[18] Netsize, 2004

One other thing heavily affecting mobile payment cultures is country specific end user protection regulations. Spamming is mostly forbidden and sponsoring messages has strict rules (Belgium). Subscription services usually have a maximum price (UK) or have a procedure to ensure that a user has subscribed to the service (Austria). Also some regulations limit the pricing and the use of some services such as setting a maximum price for logos and ring-tones (Portugal) or alerting with a warning message after 10 premium SMSs (Norway).[19]

3.6 Summary of Payment Cultures

Cooperation between banks, telecom operators and other payment system developers is essential when developing successful payment systems. Otherwise a variety of competing systems will exist in the market. A lack of this cooperation has lead to insufficient and poorly performing payment systems in many countries. Credit cards can be seen as a global electronic payment system because over 75 percent of international customers have at least one suitable credit card for Internet purchase mostly due to big credit card company co-operation and common billing models.

[19] Netsize, 2004

4 Roles in Payment Business

When examining the payment business as a whole we need to identify the different roles effecting how the system works and how the revenues among value network parties are divided. The following table introduces the eight most employed roles based on common definitions used in banking- and telecom business.

Table 2: Roles in Payment Business

Role	Description
1. Consumer	One who has funds for buying the content or service by using a payment method like mobile phone, payment card, online payment method or other methods.
2. Content / Service Provider	One who produces what consumers want to buy. For example, mobile phone users can purchase mobile content, like news, games, horoscopes, logos, ringtones, directory assistance, TV listings and so on.
3. Merchant	One who actually sells the content or service to consumers. A merchant also launches and advertises content or services to users. Usually a merchant requires transaction credentials from the consumer in the form of a signature, credit card number or some other PIN. A merchant usually operates from a point of sale or web shop.
4. Payment System Provider	One who can get funds from a consumer. It does not have to be realized necessarily as an independent instance. One of the payment participants can take over the role of providing payment services. Typically a bank, a mobile phone carrier or an internet service provider handles this. The payment system provider develops or purchases the required preliminary systems for payment, for example authentication services and credit evaluation services. The Payment system provider also usually bears the financial risk of the payment transaction.

5. Acquirer	In many cases an acquirer is a financial institution related to merchant, holding significant sums of money and also facilitating short loans. This means instant money transfers out and delayed transfers in. For example in a credit card payment transaction, the acquiring bank is also related to an issuer bank. Once the transaction is complete, the funds are transferred from the issuer to the acquirer to the merchant, and the consumer is billed for the goods purchased afterwards.
6. Issuer	An issuer is like an acquirer but is related to a consumer. It provides the consumer with the ability to make payments by providing a credit link or a direct link to a checking or savings account. If a merchant has the transaction credential, it can be verified against information stored centrally at the consumer's issuer.
7. Infrastructure Provider	One who can connect the payment parties together. For electronic telecom payments these services provide access to different landline and mobile network operator's networks. In the mobile environment, the transaction dynamics are similar to landlines although the form factor that contains the transaction credentials is different. Additionally, in the case of remote payments, the transport of payment details will involve a use either a browser-based protocol, such as WAP or HTML, or a messaging system, such as SMS or USSD. Alternatively, the transport of payment details could be via Bluetooth, infrared, RFID or contactless chip in the case of proximity payments. Due to the wide range of mobile operators and protocols, one part of this infrastructure is third-party service or payment providers. They offer payment partners access to multi-operator network that proposes numerous services and manage commercial and technical relationships with telecom operators to guarantee a high-quality network infrastructure for payment partners.
8. Support / Service Provider	One that supports actual payment transactions by providing additional services like credit information verification, customer identifications and clearing houses.

In the next chapter these roles are linked with payment system's technical architecture so that different business relations and revenue share models can be seen amongst these roles.

5 Electronic Payment Architectures

This chapter introduces three general models of different payment architectures, for telecom payments, credit card payments and other stored value online payments. These architectures offer examples of the kind of roles needed for these payment systems to exist and operate. While there are other architecture possibilities, most of the current electronic payment systems are based on these three.

5.1 Telecom Payments

IVR and premium-SMS payment systems have traditionally been "post pay" systems where the user makes a call or sends an SMS to a number and receives a service or a product. The user will be billed to a landline or mobile phone bill by the operator providing the service agreement.

The previous chapter defined basic roles for the general payment process. Now it is possible to illustrate a more detailed architecture of traditional telecom payment process and map the roles in it. Note that this architecture does not include the actual product or service delivery to customer. Next is placed an image that illustrates traditional telecom payment architectures.

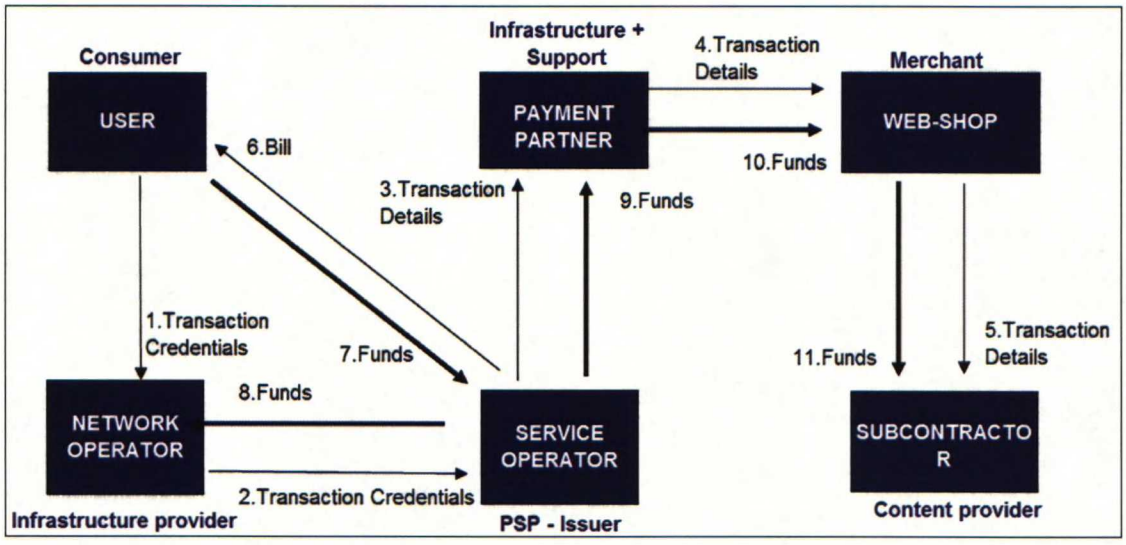

Figure 4: Post pay telecom payment architecture with roles

The boxes illustrate sample businesses involved in payment transactions. Next to the box can be found the role related to each sample. Many roles can exist for one box. Between boxes exists information that has to be transferred to make the transaction authenticated and monitored.

Bold arrows indicate money flows among participants in payment transactions. The amount of every bolded money transaction arrow is based on revenue share agreements between parties. This architecture does not indicate the event when a user is actually paying the bill because funds are usually transferred back to the service operator who actually bills the user.

Transaction's credentials are information usually required for authenticating valid money transactions and are not shared among all parties. Only required transaction details are sent after authentication. For example, in online payments, the merchant should not need to know a user's credit card or even phone number to track transactions in its systems. Of course, sometimes in telecom payments it is hard for a merchant to identify a user who needs help-desk service if the user's phone number is not sent with the transaction details.

Numbers in this picture mark the order of events actually happening in the transaction. In this architecture a user sends an SMS via a mobile network provider to service operator who identifies the user. Then service operator sends relevant transaction details via payment partner to web-shop, which completes the payment. Usually on a monthly basis, the service operator sends a bill to the customer and totals the payment transactions. Based on that, it takes its share from the revenue and remits the rest of the money to the network provider and web-shop who then share the remainder with subcontractor. It is good to understand that in case of a commonly used postpay model, service operator is giving money to network operator and payment partner usually 30-60 days after getting money from the user. This can be a problematic issue to the web-shop as time between web-shop delivering services or goods to user and actually getting money out of it can be months. For most businesses the merchant wants to have money as soon as possible and having money in advance would be optimal.

The payment partner's role in this architecture is to provide common technical interfaces and infrastructure to merchants, like web shops. Usually there is a need to integrate

payment system to support many local mobile phone operators. This makes direct technical integration usually very time consuming and costly. The payment partner makes operator deals and puts them together so that common interface with easy streamlined fund transfer can be provided to merchant. Besides technical issues, it is mostly an unsuitable idea for small merchants to attempt deals with all big operators and also collect the revenue from many sources. It usually requires too much time and effort and terms with operators can be much worse than with big payment partners.

5.1.1 Other variations

There are also many other variations of this architecture. If a credit card is used for example to pay for a service bought via SMS, an acquiring bank with which service operator operates is also needed. The acquiring bank transfers transaction credentials to user's bank, issuing bank, which actually sends the bill to user. Authentication usually happens then in the issuing bank. As a result, the operator gets funds directly after transaction and can share it to other partners directly. The problem with this is that transaction credentials, needed by issuer bank, must be transferred from user to service operator during the transaction or at least be stored within the operator's database.

It is also possible to make prepaid SMS service by bringing external user's electronic purse to this architecture. Prepaid cards, which can be bought from local grocery stores, ideally work like electronic purses. You do not need to transfer funds to the purse but activate the purse with some ID code from a prepay-card. Online-funded prepaid purses also exist. More detailed architecture of online credit card payments and electronic purses are described in the next paragraph.

5.1.2 Cost structure

There are different costs associated with the different roles in this architecture when making a telecom payment transaction. Development of infrastructure and systems, billing, advertisement, customer or merchant support and maintenance are the biggest sources of these costs. When one company takes multiple roles in this architecture, some overlapping costs can be reduced.

Usually a telecom operator provides both the infrastructure and payment system for end users. Sometimes the operator even provides one point access to competing operators by taking ownership of the entire infrastructure and support activities. Many operators also

run their own web-shops where they sell mobile content and other products to end users, operator-independent. When an operator has control over the entire payment process, less competition exists in the market and the power of the merchant to get good payouts declines. In many cases, merchants also develop the actual content and the role of being a merchant is as a sales channel for the content development business.

The basic rule for transaction costs regarding telecom payment transactions is infrastructure and payment system providers combined with the payment partner together charge 33% each of total transaction costs. The size of transaction commissions is also very much tied to usage volumes. This is why telecom operators' commission pricing models usually have a fixed part and variable part calculated on the number of transactions made. In micro-payment transactions of 1 to 2 Euros, transaction costs are typically 50 to 75 percent of the total end user price. The remaining 50 to 25 percent of the end user price are shared amongst merchant and content provider. There are currently few countries where over 5 euros macro level telecom payments are possible. In Finland, when paying for a 20 Euros transaction, transaction costs are on average 30 percent per transaction. In some countries, to make above 2 Euros transactions, users must send 2 SMS messages which increase the total transaction costs slightly.

5.2 Credit Card Online Payments

The biggest single global online payment method for buying goods online and subscribing online content is an online credit card payment system. The basic architecture for the credit card online payment is the following: Consumer goes to merchant's web-shop to buy something and chooses to pay with credit card. User enters all required information, like name, address and credit card number, to payment partners' web-service integrated to the web-shop. Consumer and merchant then get confirmation of transaction. The payment partner sends the transaction credentials via acquirer bank to issuer bank for transaction verification. When the Issuing bank verifies the consumer, it bills the consumer and sends funds to the payment partner via the acquirer bank.

Of course, the consumer receives the actual bill such as once a month that contains all the transactions during the last month but it is usually up to the user and card provider whether the user should pay that bill the next month or little by little during following months. In the normal course when an issuing bank and acquiring bank operate in different countries, a

clearing house is needed for transferring funds between Issuer and acquirer banks. Because of a banks involvement in process, a good thing about credit card systems is that money is transferred through the chain just after a buying transaction occurs. In this architecture the payment partner is needed to provide common interface and streamlined payment process to merchant by providing access to many different credit card companies. Below is an illustration of this architecture.

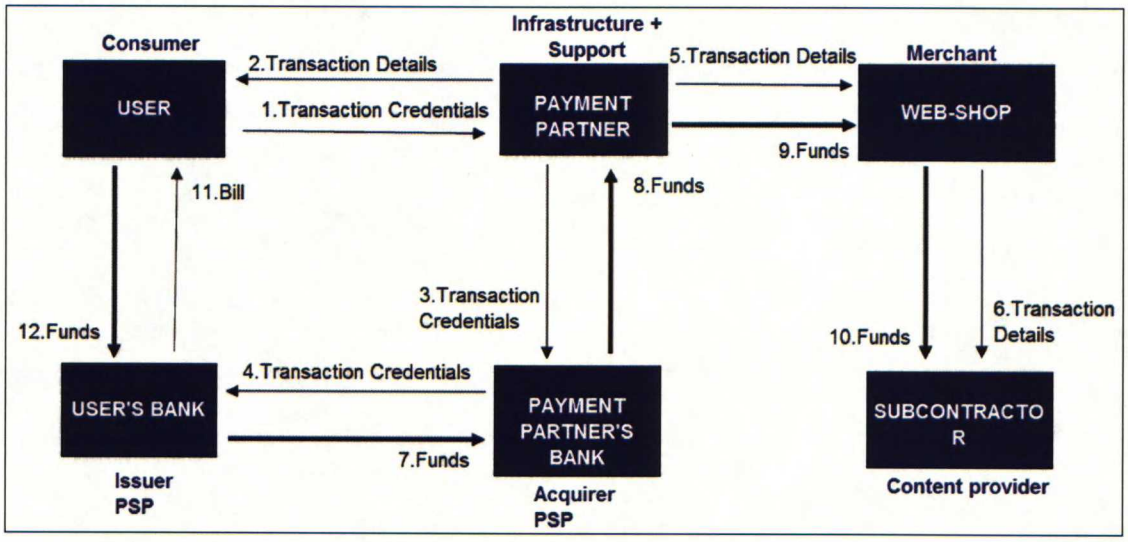

Figure 5: Credit Card payment architecture with roles

This is a simple way to make online transactions and is currently one of the cheapest online methods due to high volumes and banks prevalent role in the payment business. A common problem lies on sending transaction credentials to payment partners over the public web in every single transaction even if SSL is used. Should this information fall into the wrong hands, it is easy to misuse.

Most big web-shop merchants also take over payment partner's role and store transaction credentials in their database to make the payment process easier to use but this usually requires the consumer to register to the web-shop prior to payment. During the transaction, consumer only needs to send username and password over the public web, which mostly increases security. This information can usually be misused only in this particular web-service. If transaction credentials are stored in the payment partner's or merchants database, consumer need to trust that the information stored is in a safe place

and not given to any third party. This can also increase helpdesk-service needs for the merchant.

5.2.1 Other variations

There are different variations of this architecture. In the direct debit card model, an issuing bank can take the money directly from a customer's bank account without monthly billing. In the SET model introduced by big credit card companies, transaction credentials go from the payment partner to the issuing bank via a special clearing house. Funds are then transferred directly to the payment partner.

5.2.2 Cost structure

There are several costs related to the different roles when making a credit card payment transaction as in the telecom case. In this architecture, usually one company can have multiple roles if it is a user's bank with a wide client base. Credit card companies normally do not provide content services; they are more focused on having a globally wide client base and provide high volume, cost effective payment systems for merchants.

The basic rule applied when evaluating transaction costs in a typical credit card payment transaction is that banks charge based on purchase amount and payment partners based on number of transactions. This is why credit card provider's commission pricing models traditionally consist of fixed and variable parts which are calculated based on purchase size.

Some credit card micro-payment system providers bundle many small purchases into one big one so that some transaction costs may be avoided. In credit card transactions however, transaction costs are typically 50 cents per transaction plus 3 to 5 percent of total end user price. As a result, for less than €1 payments, transaction cost can exceed 50 percent of the total end user price. In some cases where items cost around €1 and where average users buy tens of items during a period of time (billing period) such as iTunes, a 50 cent flat transaction cost can be divided amongst all transactions. In that way the total transaction costs per transaction is around 5 to 10 percent of the end user price.

5.3 Stored Value Online Payments

Electronic stored value accounts or electronic purses are a common model for today's payment systems. These, usually all new electronic payment methods, are based on the premise of a user possessing a pre funded and stored value account.

In this architecture, the user first registers to the purse provider's service giving all required information needed for the transaction. The user then transfers some funds to the purse provider by using another offline, online or telecom payment method. The user can now go to the merchant's site and make a purchase and accept it by giving transaction credentials supplied by the purse provider during the registration. The merchant's web-shop then authenticates the user from the purse provider. Also, transaction credentials are transferred to mark the payment transaction to both ends and probably to the subcontractor as well. After the transaction is confirmed, the purse provider takes a small commission from the funds and transfers other needed funds to the web-shop who then takes its share and gives the rest to a subcontractor.

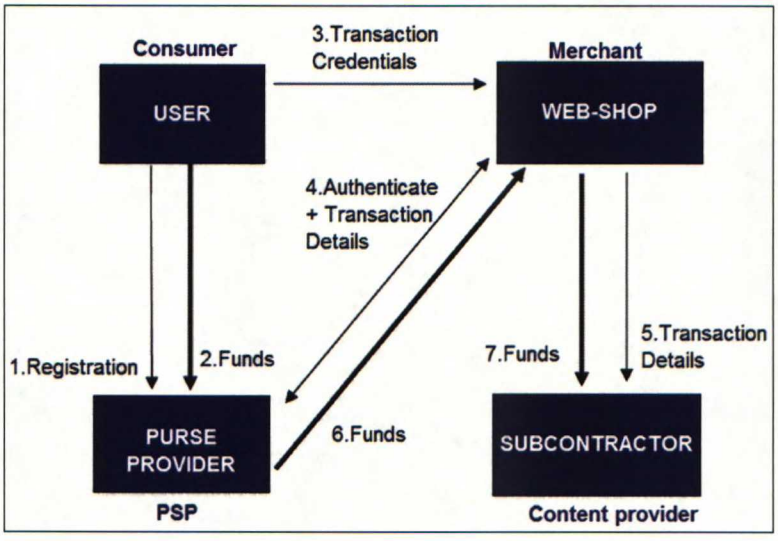

Figure 6: Prepaid electronic purse architecture with roles

5.3.1 Other variations

Many variations of this architecture also exist. In some cases a purse provider's account is integrated to a web-shop so tightly that the transaction credentials are only seen by the purse provider. In some models the user has his electronic purse stored in a local computer or mobile terminal. An e-banking system can be also seen as a pre funded

electronic purse. A positive feature of the e-banking system is that users need not register to the service or use any other payment method to fund its account. This makes the overall payment process easier and cuts overall costs.

5.3.2 Cost structure

In electronic purse payment systems, the total transaction cost is usually based upon the purse provider's transaction costs. These costs include infrastructure, billing, marketing, maintenance, development and other external transaction costs. External costs are generated when some other payment systems are used for transferring funds to a purse, such as credit card. That is why transaction costs in purse payment transactions vary significantly. Of course, purse providers always try to get costs as low as possible to promote merchant acceptance. For example, for Finnish e-banking payments, transaction costs are 5 to 30 percent depending of total end user price, but usually not less than 50 cents per transaction. In many cases transaction costs are tied with usage volumes and purchase amounts like telecom and credit card cost structures.

5.4 Summary of Architectures

Electronic payment system architectures can be divided into three basic categories. The selected architecture directly affects the production costs of a particular system given the number and nature of different roles in the system. Also the total number of purchases and average purchase size has significant role in transaction production costs. Next figure compares typical micro level transaction costs among different architectures.

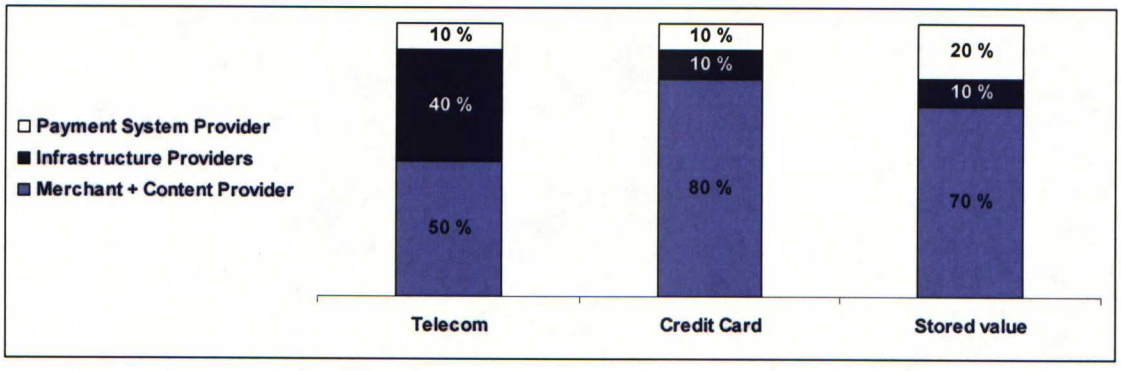

Figure 7: Production cost structure comparison in micro payments

Normally in micro level telecom payments the Network Operator takes 80 percent of total Infrastructure Provider's percentage. In micro level credit card payments both Issuer and

Aquirer banks are taking equal share from Billing Service Provider's percentage of total transaction. In stored value payments the Infrastructure Provider is mostly bypassed by integrating merchant to Payment System Provider's system directly. In this way the merchant's and subcontractor's share can be 80% of total transaction value. Also Payment System Providers share can vary a lot depending on actual system in use. Usually when one company has several roles in a payment system it usually has more power over the system and total commission shares.

6 Case Study – Habbo Hotel

6.1 Introduction

Habbo Hotel is a multi user online gaming environment developed by Sulake Corporation[20]. At Habbo Hotel, users usually aged 10 to 18, can chat, make new friends and create their own rooms, games, contests and groups. Each person in the hotel is represented by a personalized figure called a "Habbo". Habbo Hotel is a safe, non-violent and creative environment that encourages teenagers to express themselves in many different ways and allows them to become who they want to be without real life restrictions. There are currently 4 million monthly visitors in 16 Habbo Hotels in different countries, including the United States, Canada, UK, Sweden, Finland, Denmark, Norway, Spain, Italy, France, Netherlands, Germany, Singapore, Australia, Switzerland and Japan. The target group of Habbo Hotel is teenage girls and boys aged 10 years and older, both genders are equally represented. Also these teenagers have regular access to a personal computer connected with a broadband Internet connection and have disposable income they may spend on gaming.

6.2 Basic Business Model

It is free to register, check into the hotel and wander around chatting and meeting other Habbos. There are many users who enjoy the service for free as it is free to register and play. So how does Habbo Hotel make money?

Habbo Hotel charges for gaming elements like diving in the swimming pools, Habbo Club membership and room furnishings. These items are paid for with Habbo Credits, the hotel's currency. Habbos can decorate their very own private rooms with virtual furniture, such as sofas, beds, televisions, posters, bars, potted plants, and bottles to play "spin the bottle".

Depending on the country, Habbo Credits can be bought in a variety of ways including credit card, SMS, IVR, e-banking and other online methods. Habbos can for example, send an SMS message via their mobile to purchase these items and the charges show up on users' monthly bills. Once a Habbo buys something, he or she can give it away to

[20] Sulake, 2005

another Habbo, or swap it in one of the private bartering rooms. From a merchant's point of view, there are actually two customers at Habbo Hotel, namely, the teenage Habbos themselves, and the Habbos' parents or guardians.

A positive business aspect in selling virtual goods like furniture in Habbo Hotel, is that copying costs are virtually nothing as in most other digital businesses. But what distinguishes sales of Habbo Credits from sales of such things as digital music over the Internet, is the absence of any external parties such as artists or record companies sharing in sales. Currently, record companies take approximately 66% of the current end user price of a single song sold in iTunes[21]. For Habbo Hotel, it is possible to even give away Habbo Credits for free without losing much money. The more Habbo Credits are sold, the closer the production costs are to zero per Credit.

One Habbo Credit usually costs around €.20 each, depending on a country and as such falls into problematic micro payment category. However, instead of selling one Credit per transaction, Habbos receive bundles of Credits or many Credits at the same time depending on current end user price. Credits are then stored in the Habbo "Purse". The Purse is an electronic wallet designed for Habbo Hotel. The downside of bundling is that there is no way to buy one Habbo Credit at the time. Furthermore, money spent on extra Habbo Credits is not redeemed to the Habbo. Nonetheless, this model of pre-bundled Habbo Credits has many advantages when dealing with payment system transaction commissions.

6.3 Roles in Habbo Hotel -Payment Systems

Habbo Credits can be bought by different selected payment methods. These methods vary based on country and culture in hand. The previous chapter contained a definition of roles for different payment architectures. Now we turn to mapping Habbo Hotel in general to those architectures.

The company behind Habbo Hotel, Sulake Corporation Oy headquartered in Helsinki, has two main roles in every payment system architecture, namely; Merchant and Content provider. Sulake works as a Content provider when producing the Habbo Hotel game. It

[21] iTunes, 2005

also works as a Merchant or publisher when selling and advertising the product or at least part of it to consumers.

All Habbo Hotel telecom payments pass through selected payment partners which support the payment process by having established connections to several major landline or mobile operators. The mobile or landline operators provide the core infrastructure and the payment system behind the payment process. Currently, an exception to this can be found in Finland where the mobile operator Elisa operates as a payment partner and provides a single SMS gateway to all Finnish operators including its own. Also some smaller network operators such as Saunalahti, that only operate as an issuer and payment system provider, employ either Sonera's or Elisa's network infrastructure for delivering premium SMS. In this case, an SMS message may actually go through 3 different telecom networks. Interestingly, Elisa owns a part of Sulake Corporation. Due to this ownership/partner relationship, Elisa has some control over every role in Habbo Hotel Finland's SMS payment process.

All Habbo credit card transactions flow through selected payment partners. Usually all roles defined in the credit card payment architecture are operated by different companies. Sometimes the same company can have two or three roles. In the case of Finnish Luottokunta Oy, it handles all Finnish Visa cards and can operate in all of these roles simultaneously; payment partner, Issuer and Acquirer banks.

In case of electronic purses and e-banking solutions, Habbo Hotel currently operates directly with the "purse provider". There are some companies, like PayByCash in USA and Canada, trying to operate as a payment partner supporting many methods. However, there is not much incentive for a merchant to use an extra company in a payment process value chain unless they are interested in having more unpopular payment methods.

7 A Framework for Evaluating Payment Systems

From a technology perspective, payment systems are usually evaluated by measuring server response times, system security levels or liability issues. Another popular approach is to concentrate only on the usability side and measure the effect of different user interfaces upon user behaviour. To understand why some payment methods or systems are more frequently used or generate more profit than others, there has to be a more complete and general method to evaluate the payment systems in question. The purpose of this chapter is to assist in finding a suitable combination of methods to create the best possible overall payment system required by Habbo Hotel.

7.1 Defining Key Criterion

In order to formulate a suitable framework for evaluation, the key variables need to be determined and defined first. Selection of values here was made so that they take into account issues such as cultural, technical and usability differences. Production cost effects through commission share percentages must also be factored in. Finally there is a risk percentage definition added to this framework to evaluate more accurately how viable the system is for a merchant.

7.1.1 Target group coverage

One of the main starting points when evaluating a payment method is to assess the accessible market. This target group coverage simply means the percentage, from 0 to 100, of the target group that is able to use the method both directly or indirectly. For example, if a target user-group is middle-income upwards in large American cities aged 18-30, the overall credit card coverage percentage would be in the neighbourhood of 90%. However, if the target group is the same but aged from 10 to 15, the credit card penetration is half of it, approximately 45%. Most of these users will in fact have access to their parent's credit cards. If there is provided only one credit card option, for example Visa, with a 33% market share, then the corresponding target group penetration would be approximately 15%.

7.1.2 Usability

Usability related issues are a key factor affecting users' usage habits and usage frequency. The easier and more informative the method is to use, the more likely users are to use it. To make the payment method usable requires many factors such as; a) how

streamlined the method is for the user, b) how money is collected from the user and c) how easily the user can learn to use it and d) make payments frequently. Also cultural habits and learned consumer behaviour directly impact payment system usability.

Usability in this evaluation reflects how much effort on average a user must expend in order to make one payment transaction. So even if a credit card system is easy to use from a technical and user interface point of view, it may still have low usability if the user needs to make an extra effort to get their parents credit card first in hand. User interviews, expert analysis or more formal methods, like heuristic evaluation or cognitive walkthrough for determining the right value for this may be employed. The values mentioned here are scaled from 0 to 100 with a score of 100 reflecting the best possible overall usability and 0 being impossible to use. It is good to define some different reference methods first and then compare other methods for more reliable results.

7.1.3 Response time

One separate variable related to usability is determining how "real-time" the method is. This is separate from usability due to its importance in real-time payment environments such as online multi-user network games. Response time is a value that measures the payment task from the moment of making the payment decision to the moment the user actually receives the product or service. Getting the service in this context means, for example, when a user sees that the transaction has affected his or her online game-system. The selected billing model, whether it is prepay/postpay or subscription scheme also has an effect on this value. If, for example, the user chooses to pay with some prepaid electronic purse payment method, the user need to first make sure the necessary funds are in the purse.

The response time value is scaled from 0 to 100, with 100 the best in cases where the user receives the service instantly (real time). To estimate the time where response time is 0, user interviews can be used and questions like, "when user feels that it is too long time to wait for the service", can be asked. This is of course heavily related to offered service and target group and varies a lot. Also this scale from 100 to 0 is not linear because the more time the payment task has taken the less meaningful it is to wait an extra minute. Here is a set value 0 to correspond 5 hours waiting and negative exponential curve is used

to find the correct value. So this value (R) can be estimated if the variable t is known, which reports the average time in seconds, by using following equation:

$$R = 100 \cdot e^{\frac{-t}{3600}}$$

Below is a table showing some example response time values, calculated using the above equation. The equation employed should be adjusted based on actual service response times required.

Table 3: Some example response time values

Average response time in seconds (t)	Corresponding response time value (R)
1 second	100
1 minute	98
1 hour	37
Over 5 hours	0

For more accurate results it is good to measure a few different response times and calculate the average. Every payment method also has some usability related learning curve effecting this value. Usually it is recommended to use only values from advanced users. For example, if the user uses SMS billing, the first time may require a few minutes to make a transaction. However, when the user has learned the process it takes only a few seconds to make a new purchase.

7.1.4 Revenue share

The payment system partners' and other network infrastructure providers' total commission percentage is one important value affecting merchant's real share of sales revenue. Merchant's revenue share after commission can be calculated by taking one minus commission percentage. Therefore, 100% means no commission exists while 0% means all revenue is required to pay commissions to the payment system partners. It is notable that usually commissions contain a fixed part, for example monthly fee and a variable part that has for example correlation to monthly usage volumes. So in order to estimate commission percentage, some usage volume estimations also needs to be made in many cases to arrive at a more accurate value. In some business models, the payment partner's commission is added onto end user prices and the revenue share is always

100%. This works well in some countries. However, many countries have legislation requiring the same end user price independent of the payment method used.

7.1.5 Risks

There are always risks of chargebacks, fraud or misuse of a payment method. When this occurs, some of the proceeds from the transaction must be reimbursed by the users, banks or operators. This is normally some percentage of total revenue. Here a percentage value is defined so that 100% means no risk exists while 0% means that the risk is 100%. This value can usually be estimated based on contract information, previous experience and country specific information. Also, if the system is not technically secure, it will likely suffer more fraud. There may also be payment partner specific levels of monthly chargeback percentages. Exceeding these can lead to a situation where the whole payment method has to be closed. So the risk can be higher that it appears at first. There are many risk analysis tools to locate the right value for this.

7.2 Evaluating Payment Method Viability

When evaluating payment method viability two different points of view exist namely, that of users and merchants. Both have different evaluation criteria. To factor this in requires two key values for every method. Now that the basic variables affecting a single payment method are known, the primary usage likelihood percentage and the total overall viability value of the payment method can be calculated.

7.2.1 Primary usage likelihood percentage

The primary usage likelihood percentage is a value denoting how many users are likely to use this method as the primary one. To calculate this we take the average of usability and real-time, divide it by 100 and multiply it with target group coverage. This percentage gives a basic understanding of how popular the payment method would be among users.

7.2.2 Method viability value

When the primary usage likelihood percentage is known, it is possible to calculate the method viability value that closely measures the revenue potential of the method to the merchant. To do this, multiply the usage likelihood percentage with risk and commission percentages. The result is a number between 0 and 1. The closer the number is to 1 the better the method is. The table below illustrates example systems, *A* and *B* and their variables and overall viability value.

Table 4: Calculating example payment methods' goodness

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
A (online)	40%	95%	90	70	**32%**	95%	**0,29**
B (offline)	100%	99%	0	10	**5%**	99%	**0,05**

Previously we calculated the basic variables that affect payment method viability. It can be seen that improving any of these variables has a direct effect on the payment method's viability and a single method's revenue generation ability. If the viability value of some method is close to 0, it usually means there is no reason to use it in real life systems.

7.3 Evaluating Payment System Viability

Usually, all electronic payment systems provided by merchants are combinations of different payment methods. This gives wider target group coverage and enables different buying behaviours leading to better revenue generation. To calculate an overall payment system viability value, all methods' viability values can be added together. Therefore, in the previous example system's, *A* and *B*, the total viability value would be 0,34. This value can also be over 1. In that sense many single poorly working payment methods combined can have better viability value than one singe well working payment method.

Similarly, by adding all methods' primary usage likelihood percentages, we can see the level of payment system from a user's point of view. If the total value is around 100%, it indicates that most users are willing and able to use at least one of the methods. In the case of 200% score, users can choose between a few different payment methods that are good enough for them. Having a high percentage here is good as users have more options about what payment methods to use and some users can have many primary payment methods in parallel.

7.3.1 Method uniqueness variable

However, occasionally the total system viability value can be misleading if overlapping methods exists. For example, if one SMS-service provider has access to *A* and *B* - operators' networks and some other SMS-service provider has access to *B* and *C* operators' networks, then both SMS-services have only 75% average uniqueness in the

overall system because of overlapping *B* -operator. This percentage can be multiplied with method viability value to ascertain a real viability value for the methods and system.

7.4 Developing the Optimal Payment System

When a merchant needs to make a new payment system for its service, it usually needs to determine what payment methods to implement. If a merchant has some methods in place, it may also want to optimize the system to reach better profits. To define an optimal payment system based on available methods, a primary usage likelihood percentage and a viability value is needed from each. If we want the average user to have access to some of the payment methods and we assume that a user follows a single buying behaviour, to make an effective payment system the total usage likelihood value of selected methods in this simple case should be close to 100%.

Of course, it is usually desirable to exceed this level to permit more options for users. The rule of thumb for extracting the best revenue from the system is when a system has 3 or 4 different options for each user targeted to different buying behaviour needs. It is possible to have online and offline methods for both micro and macro payments. For a merchant this means a) in case of online micro payment methods, access to high user volumes b) in case of online macro payment methods, access to low commission and c) in case of offline methods, access to users' cash. It is always good to cover at least these three method categories in this type of analysis even when developing a system for buying a product such as ringtones. It is more a business decision whether a payment system should support all of these three aspects.

It is good to bear in mind these categories work individually. Therefore, adding a new method to support offline buying behaviour would not effect either micro or macro online payments. In this way the method only increases a system's viability value. It is usually good to have 1 to 3 optimally functioning methods for each category. If there are more than 3 parallel methods in one category, biggest risk for merchant is that some less popular methods are used more infrequently than they optimally would be and costs per transaction increases. Also, users may view an overall system of many different payment methods as confusing.

7.4.1 Method evaluation chart

A method evaluation chart is a good way to view the effectiveness of the methods in the system for both a user's and merchant's point of view. In the following example there are defined six (6) different payment methods marked from *A* to *F* and inserted those to same graph based on viability and likelihood values.

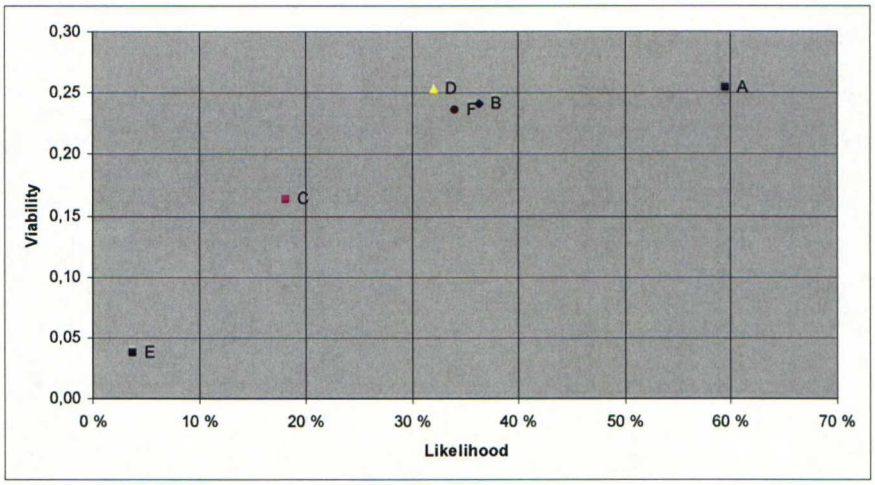

Figure 8: Payment method evaluation chart

What is demonstrated here is that method *E* will not be popular from a user's point of view and also method *A* is very popular one, having over 10 times greater likelihood percentage. Also similarly can be seen that method *E* has a weak viability value for merchant and methods *D*, *F*, *B* and *A* has over 5 times greater value on that compared to *E*. If some methods are close to each other it indicates they are equally sufficient for users and the merchant. The more a method is located rightwards and upwards the better the method is in overall. Usually methods are located so that they are a bit below a line that goes from (0,0) to (100%,1.0). So the maximum values for single method's likelihood is 100% and for viability 1.00. The main point of system optimization is to get all methods moved from the left bottom corner to the right top corner.

7.4.2 Comparison of systems

To compare different payment systems overall, it is possible to make same kind of chart that only has systems' total viability and usage likelihood values. Lets say we have a case where we have the above combination of different optional methods from A to F. Methods

A and *B* are telecom payment methods, *C* and *D* are payment card or electronic purse methods and *E* and *F* are some offline methods. The following example defines *System A* to contain some methods from every group (*A*, *D*, *F*) and *System B* containing rest of the methods (*B*, *C*, *E*).

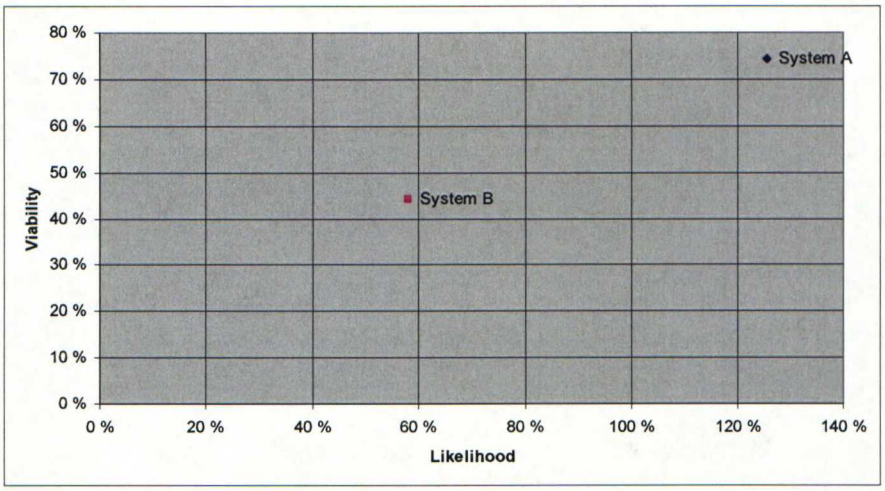

Figure 9: Payment system evaluation chart

With this chart it can be clearly seen how promising *Systems A* and *B* are. Users are twice as willing to use *System A* and more importantly is that viability, or the ability to make revenue for a merchant, of *System A* is almost double compared to *System B*. So choosing a good set of methods to a system can make a big difference overall to system performance.

7.5 Evaluating Payment System Changes

We have demonstrated how to calculate viability value of a payment system but for a better understanding of how payment method changes in the system impact the ability to make better revenue, some more calculations are required.

7.5.1 Adding new method in place

In a long run, system viability value correlates with a system's ability to generate profit. However, when changing combination of methods in the system, it takes time when usage reaches this saturation level.

If there are online payment methods *A* and *B* in place and one desires to see what the effect on revenue is when adding online payment method *C* to system, it is possible to just compare system viability values after and before change. The easiest way to calculate this viability increase percentage is by dividing the new viability value with the old one and subtract 100%.

This change percentage has a direct correlation to potential revenue increase but we first needed to know how users react to change and what is the revenue effect on other methods when adding a new one. This means the percentage of users that start using the new method instead of some old one. Estimating how many times better the new method is compared to the older one can be done by calculating the old method's viability value and multiplying it with the new method's viability value. Through counting these values from every old method and adding them together we arrive at a percentage that has to be taken from change percentage to get actual revenue increase percentage. Payment system improvements such as adding new methods generate more paying customers.

Of course other buying behaviour changes may result when adding a new method to system. For example, if the primary target group is teenagers while in the old system the dominant payment method has been parents' credit card, adding IVR or SMS may dramatically decrease usage of credit cards. If this kind of effect is expected some changes to values such as "usability" should be done to get realistic revenue increase values. Below is an example where method *C* is added to an existing system including *A* and *B* methods. The system viability improves 74% and expected revenue improvement after commissions is 65%. This 65% is not a guaranteed revenue increase percentage; it is more like potential one.

Table 5: Revenue increase example when adding new method C

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability	Revenue increase
C	50%	60%	95	80	44%	95%	0,25	**74%**
A	40%	95%	90	70	32%	95%	0,29	-7%
B	100%	99%	0	10	5%	99%	0,05	-1%
Tot.					81%		0,59	**65%**

If all 3 (*A*, *B*, *C*) belong to some common buying behaviour method group like online macro payments and total primary usage likelihood percentage goes over 100%, then we must scale the viability value to correspond to the value it would be with a 100% usage likelihood. This can be done by dividing viability with usage likelihood.

7.6 Method Accuracy

Due to the complexity of the systems themselves combined with the complex buying behaviour of users, this method is somewhat simplified. Some criteria used here for calculating usage likelihood or viability values usually have a 5% error in accuracy on average depending upon how it is calculated or what information is used. Seldom are there more accurate base data or statistics available. Also, some values like target user coverage can change over time. So the estimation of the actual total error of this evaluation method can be close to 10-15% if multiple error sources are combined.

8 Country Cases

8.1 Country Evaluation

To analyze how this defined payment system evaluation framework applies in the real world and what are the main causes for misleading framework results, we will define five Habbo Hotel country cases. Selected countries are Finland, Sweden, USA, United Kingdom and Germany. Countries were selected based on payment method mix currently established and cultural differences.

Payment methods in these five cases can be divided to three categories: telecom, online and offline methods. Normally, all payment methods are country specific methods allowing only persons in that country to use them. Telecom methods include SMS and IVR billing; online methods include credit cards, e-banking and other online methods. Offline methods include different types of prepaid cards and postal money orders. In Habbo Hotel business, prepaid cards are paper cards which can be bought from local retailers and contain special voucher codes which can be entered into the game to redeem Habbo Credits. Credit bundles bought through these methods are usually priced so that telecom payments are micro level payments priced up to 5 Euros and online payments are macro level payments priced from 5 to 20 Euros per transaction. Prepaid cards are usually priced from 5 to 10 Euros. Other offline methods are priced from 5 to 20 Euros.

8.1.1 Habbo Hotel Finland

The first Habbo Hotel was opened in Finland in July, 2000 and has currently almost 200 000 monthly visitors. There are presently four main payment methods in Habbo Hotel Finland:

- Credit cards, which includes Visa and Master Card.
- Online e-banking, including systems from Nordea, Sampo and OP Banks including digital wallet service, Digiraha, from OP.
- Post paid SMS billings, including Elisa, TeliaSonera, Saunalahti and DNA.
- Prepaid scratch cards, which are distributed via R-Kioski.

Statistically 95 percent of registered users in habbohotel.fi are from Finland, so all payment methods are mainly targeted for Finnish customers which makes the overall analysis a bit simpler. Generally for cashless payments, Finnish people use 40% payment

cards, 55% Giros and 5% direct debits. Finns also use fewer payment cards and for smaller transaction amounts. This is promising for e-banking and online credit card payments. However, we need to keep in mind that, based on Forrester Research study in Europe, only 36% of credit card owners in average are willing to use it for Internet purchases. In general, most trusted web services in Finland are the popular e-banking services which give an excellent alternative for credit cards. In telecom payments IVR is not widely used for Internet billing purposes but SMS is very popular. 95 percent of Finns use postpaid model.for paying mobile phone bills.

Below is a table describing current payment method score table for Habbo Hotel Finland. There are no overlapping methods in place. This is a good thing. Usability value for e-banking and credit cards are 50% of what it would be for target group over 18 years old because in this case the user needs to have access to parents' credit card.

Table 6: Payment method score table for Habbo Hotel Finland

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
E-Banking	90 %	90 %	75	35	**50 %**	95 %	**0,42**
Credit Cards	75 %	95 %	75	30	**39 %**	95 %	**0,36**
SMS	95 %	40 %	95	95	**90 %**	95 %	**0,34**
Prepaid Card	100 %	70 %	50	95	**73 %**	99 %	**0,50**
Tot.					**252 %**		**1,62**

Based on above scoreboard's primary usage likelihood and method viability score values, we can now make a payment method evaluation chart for Habbo Hotel Finland as per the illustration below.

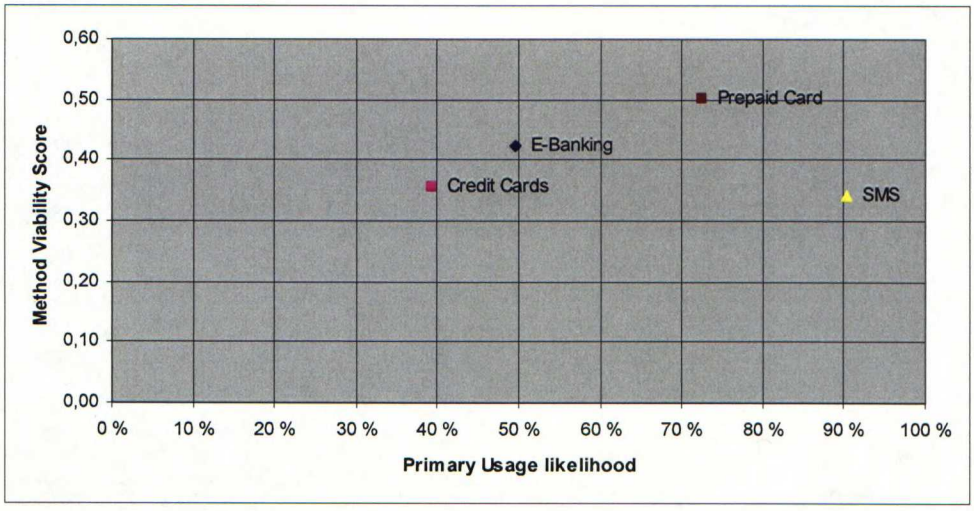

Figure 10: Payment method evaluation chart

Here we can see that users are very likely to use prepaid cards and SMS billing to buy Habbo Hotel Credits. E-banking and credit cards are actually almost half of the likelihood of SMS and prepaid cards. In this case the merchant's benefit is greatest with prepaid cards and SMS being the least profitable in general. Problem in SMS in Habbo Hotel Finland is that Elisa's operator commission is relatively high because of its power in the whole payment process value chain and its ownership stake in Sulake.

Below is a chart illustrating actual monthly revenue and profit shares from Habbo Hotel Finland. In other words, this chart shows how much users use different payment methods and how good the system is in generating profit from a merchant's perspective. So we can see here for example that SMS billing generates 50 percent of total Hotel revenue but only makes 35 percent of the Hotel's profit.

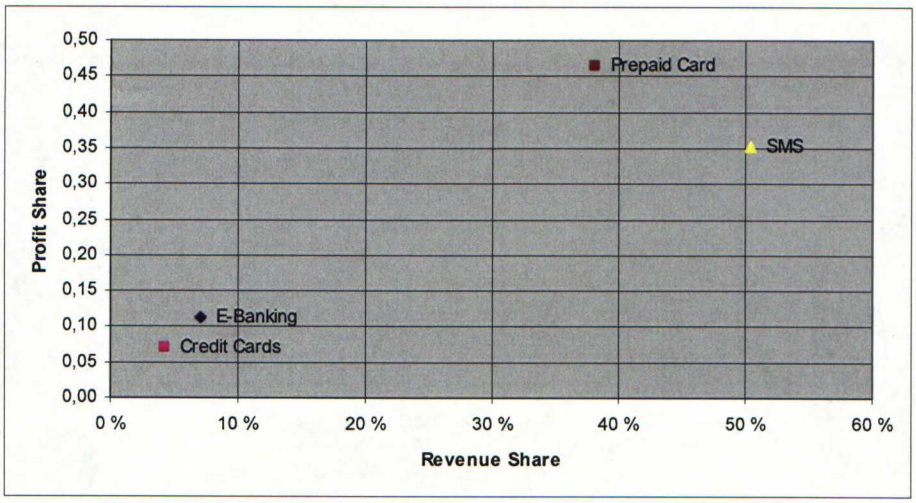

Figure 11: Actual revenue and profit shares per payment method

Below is another chart illustrating actual monthly revenues from Habbo Hotel Finland. In this chart revenue development during the recent year can be seen per payment method. There are two notable changes during the time. Monthly limits in SMS usage came active in early summer 2004, which decreased this method's revenue significantly. Another notable thing is the launch of prepaid cards in December 2004 which shows the importance of having different methods with different buying behaviors in place. In other words, prepaid cards did not adversely affect other method's revenues; it did increase the total revenue.

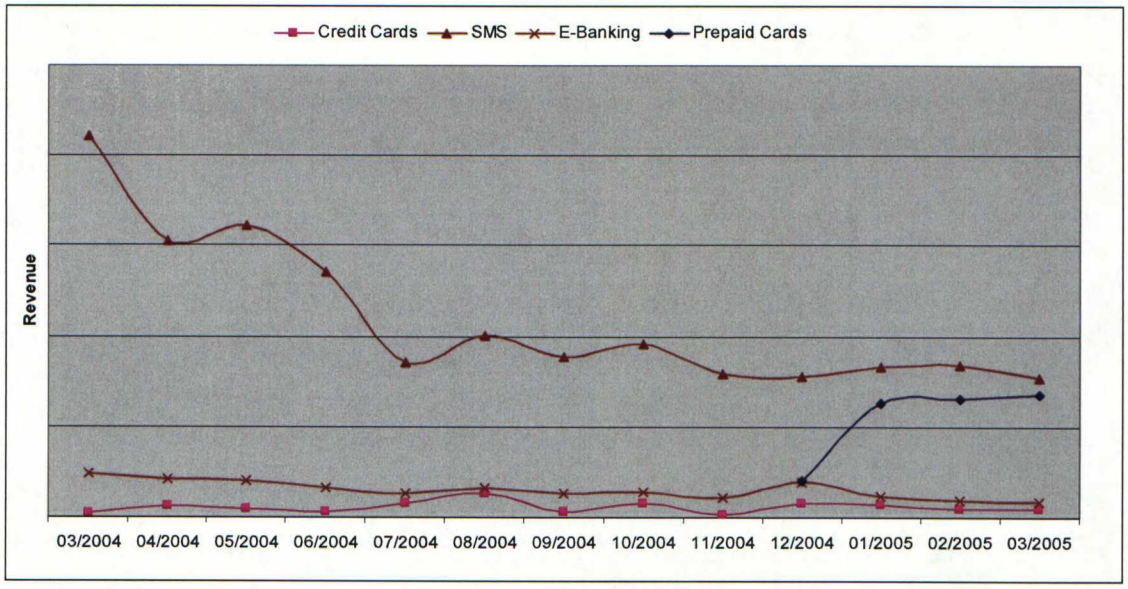

Figure 12: Actual revenue development during the last year per payment method

It seems that in Finland premium rate SMS is a very popular payment method among teenagers even if there currently is a 7 Euros weekly limit per mobile phone number. Prepaid cards are a very successful method in Finland and it appears that the average teenager has pocket money to spend on everyday fun.

So when we relatively compare the payment evaluation chart to the revenue and profit share chart we see a clear correlation. The only big difference is that e-banking and credit cards are much less used compared to prepaid cards and SMS billing than appears in the evaluation framework chart. This is mainly because the total primary usage likelihood is close to 250% meaning the average user has over two different options to buy Habbo Credits. Obviously, a user mostly selects the payment method which has better usability value. In this case SMS and prepaid cards are accessible without involving parents in the payment transaction and thus are more frequently used.

There are no cultural or legal issues that would conflict with this behavior. Technically, Finland has advanced systems for all of these billing methods with the leading e-banking systems in the world and is also a leader and pioneer in premium SMS, MT-billing (Mobile Terminated) payments. This provides better control to set additional functionality like weekly limits and free error messages. For most of MO-billing (Mobile Originated) systems

this is impossible. There is currently only one operator unable to provide the MT-billing model, but even here additional services such as weekly limits have been successful.

8.1.2 Habbo Hotel Sweden

Habbo Hotel Sweden is about one year old having been launched December 2003 and now having 100 000 monthly visitors. The Swedish Hotel currently has only two payment methods; SMS via Tele2, Telia and Vodafone and e-banking online payment via Nordea Bank.

Statistically 88 percent of registered users in habbohotel.se are from Sweden. So all payment methods are targeted at Swedes. For cashless payments, Swedes use 30% payment cards, 60% Giros and 10% direct debits. This is similar to Finland. Like Finns, Swedes also use fewer payment cards and for smaller transaction amounts. This gives good ground for e-banking and credit card online payments. The Swedish e-banking environment for online payments is not as developed as in Finland because the market leader in e-banking, Nordea Bank, has only 20 percent market share in Sweden. This the use of credit cards in Internet purchases are more commonly accepted in Sweden. In telecom payments IVR is not widely used for Internet billing purposes but SMS is becoming more popular. The biggest difference to Finland is that only 45 percent of Swedes use the postpaid model for paying mobile phone bills.

Below is a table describing current payment method score table for Habbo Hotel Sweden. There are no overlapping methods in place. Usability value for e-banking is half of what it would be for target group over 18 years likewise in case Finland.

Table 7: Payment method score table for Habbo Hotel Sweden

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
E-Banking	20 %	90 %	75	35	**11 %**	99 %	**0,10**
SMS	95 %	66 %	95	95	**90 %**	95 %	**0,57**
Tot.					**101 %**		**0,66**

Based on the above scoreboard's primary usage likelihood and method viability score values we can now make a payment method evaluation chart for Habbo Hotel Sweden, which is illustrated below.

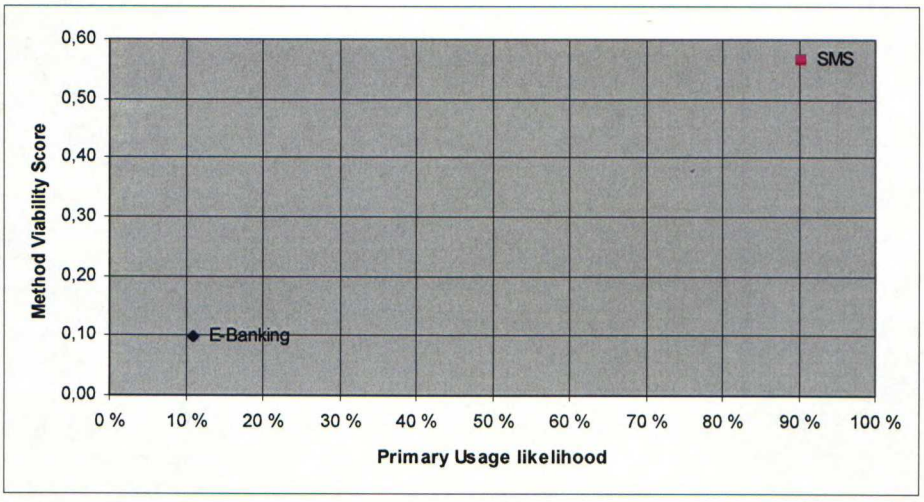

Figure 13: Payment method evaluation chart

Here we can see users are very likely to use SMS billing for buying Habbo Hotel Credits. E-banking likelihood usage is only one tenth of the likelihood usage of SMS. This is mainly due to Nordea's small market share and usability in this target group. In this case merchants benefit is greatest with SMS even though there is 66% commission payouts.

Below is a chart illustrating actual monthly revenue and profit shares from Habbo Hotel Sweden.

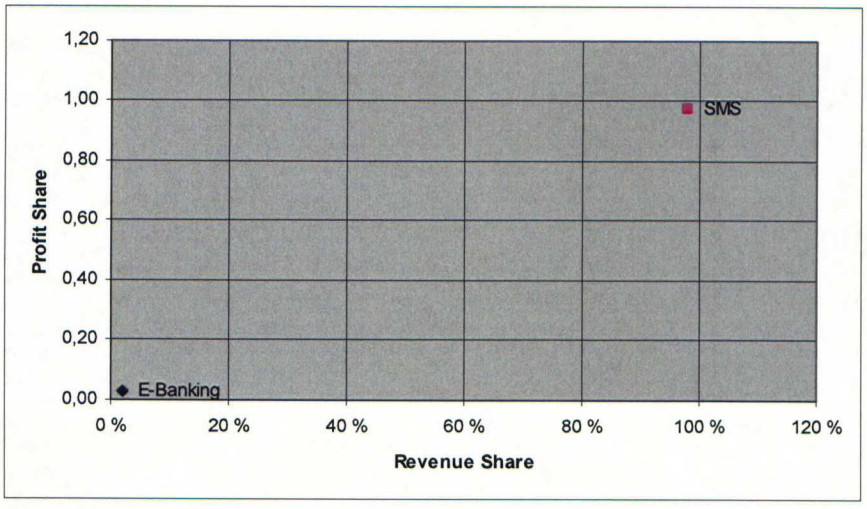

Figure 14: Actual revenue and profit shares per payment method

Below is another chart illustrating actual monthly revenues from Habbo Hotel Sweden. In this chart revenue development during the recent year is seen per payment method. As the chart shows, the future source of revenue will be purely SMS, if no additional methods be implemented. Like in Finland, SMS limits came active in summer 2004.

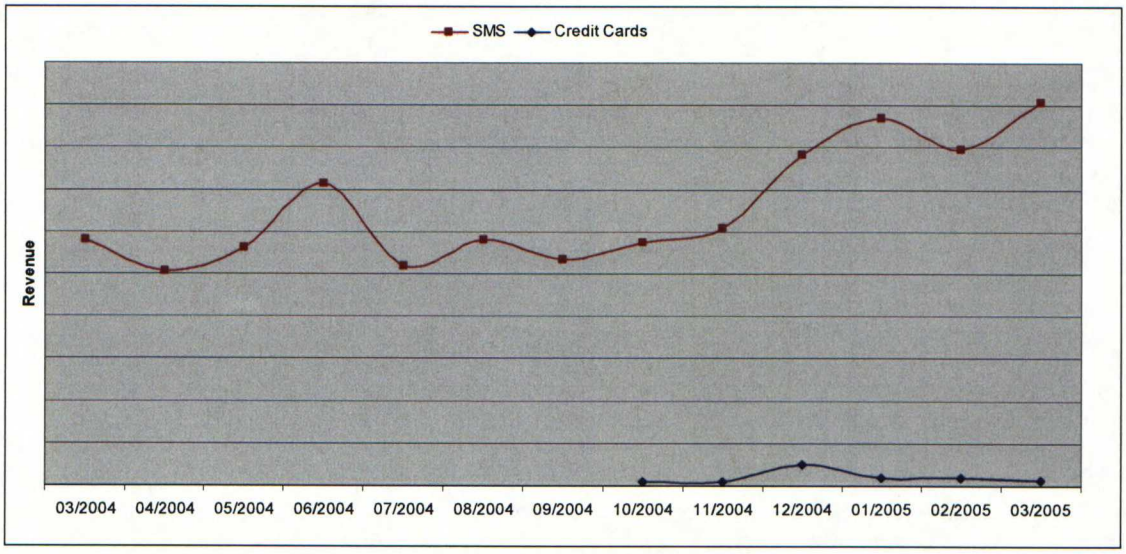

Figure 15: Actual revenue development during the last year per payment method

As in Hinland, SMS in Sweden is a very popular payment method among teenagers even if there is a 150 SEK weekly limit per mobile phone number for SMS payments. Because over half of the Swedes use prepaid mobile phones, it is common for operators to allow prepaid mobile phones for paying mobile services. This is not so in Finland which is why prepaid mobile phone billing enables partial access to users' pocket moneys similarly like prepaid scratch cards in Finland does.

So when we relatively compare the payment evaluation chart to revenue and profit share chart, we see a clear correlation. The only significant difference is that e-banking is much less frequently used than SMS billing compared to evaluation framework chart. This is mainly because SMS accesses users' pocket money and in that way actual SMS usage is double compared to relative framework values. Obviously users select the payment method which has better usability value. In this case SMS is accessible without involving parents in the payment transaction and that way they are much more used methods.

There are no cultural or legal issues that would conflict with this behavior. Technically speaking, Sweden has advanced systems for online payments and premium rated SMS with MT-billing (Mobile Terminated) is commonly used.

8.1.3 Habbo Hotel USA

Habbo Hotel USA is quite new Hotel, launched in September 2004, and has currently 400 000 monthly visitors and five different payment methods:

- Credit Cards, including global credit cards Visa, American Express, Master Card and Discovery Card.
- PayPal online payments, allowing existing PayPal account to be used for payment transactions.
- Other online methods via PayByCash, including Cyphermint PayCash System, e-gold, Check-by-FAX, hyperWALLET, moneybookers.com, Travellers Express MoneyGram, Webmoney Transfer, Western Union Swiftpay, Western Union QuickPay, Yahoo PayDirect, Cheques, eCheques and cash through the mail.
- IVR, for customers from United Kingdom only
- Money Order, through local postal office in USA.

Statistically only 33 percent of registered users in habbohotel.com are from USA. 20 percent of registered users come from United Kingdom and 20 percent from Canada. So payment methods are currently targeted for all of these three main customer groups even though users from USA are seen as a main target group and UK and Canadian users should use their own local Hotels. But of course credit cards work in most of the countries in the world and are the preferred method for Canadians. Also users from UK have an IVR line that works only in UK for buying Habbo Credits.

Generally for cashless payments, Americans use 35% payment cards, 60% cheques and 5% in other methods. 85 percent of used payment cards are other than debit cards and there exists many different cards per user in average than in many European countries. From 90 to 95 percent of US households have some kind of credit card for Internet purchases. Use of credit cards in Internet purchases are thus by default the accepted method in most of US Internet services.

In telecom payments currently IVR is not widely used for online billing purposes due to the last century's adult entertainment business which lead to a situation where most of the phone numbers designed for billing purposes are currently blocked by the end users. There are now new unblocked numbers available for online IVR services. The main problem still seems to be getting full country coverage for services.

Similarly to Finland, 98 percent of US mobile phone users use postpaid model for paying their bills. For SMS billing, operators are just starting to see the possibility of making money by allowing mobile phone billing. The main problem has been wide range of technical mobile phone systems in the market. Also legal regulations have slowed the business. Currently there is significant restructuring happening in US telecom markets and rapid growth for SMS billing is expected in a near future.

Below is a table describing a current payment method score table for habbohotel.com. There are not much overlapping methods in place. The risk value for PayPal is currently set to zero because of several chargeback issues which lead to a decision to suspend the method.

Table 8: Payment method score table for Habbo Hotel USA

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
Credit Cards	75 %	90 %	75	35	**41 %**	95 %	**0,35**
PayPal	90 %	70 %	70	50	**54 %**	0 %	**0,00**
PayByCash	100 %	70 %	15	15	**15 %**	90 %	**0,09**
UK IVR	90 %	78 %	80	75	**70 %**	95 %	**0,52**
Money Order	100 %	100 %	0	10	**5 %**	99 %	**0,05**
Tot.					**185 %**		**1,01**

So if we look at this only in US customers point of view, primary likelihood percentage is 61% and system viability 0,49. Based on the above scoreboard's primary usage likelihood and method viability score values we can now make a payment method evaluation chart for Habbo Hotel USA. It is illustrated below.

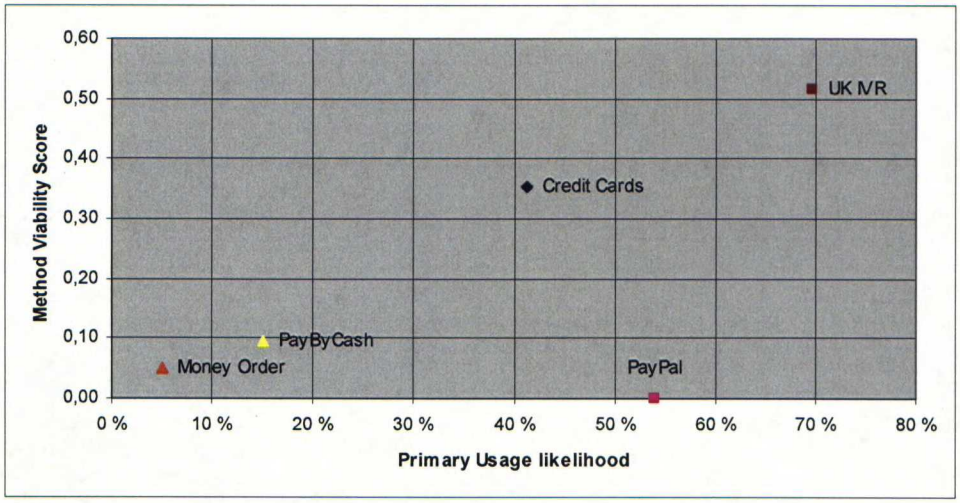

Figure 16: Payment method evaluation chart

The situation in the payment method evaluation chart for Habbo Hotel USA is a quite different from previous ones as there are users from three different countries. For UK users it is obvious that they use their IVR line for purchases even though credit cards work there also. PayPal would work there as well but is currently closed from the users because of recent fraud issues. For Canadians, credit cards are the primary method of these even though PayByCash accepts checks and other North American payment options. Below is a chart illustrating actual monthly revenue and profit shares from Habbo Hotel USA.

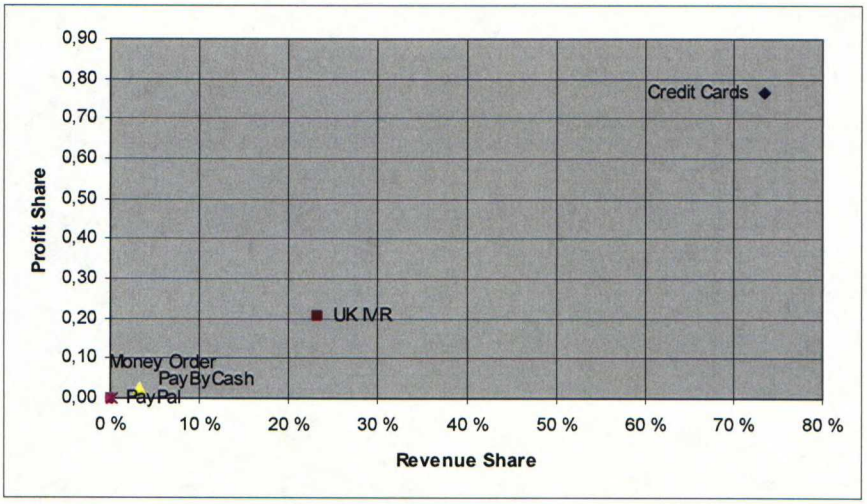

Figure 17: Actual revenue and profit shares per payment method

Below is another chart illustrating actual monthly revenues from Habbo Hotel USA. In this chart revenue development during the recent year can be seen per payment method. There are two notable changes during the time. Access to PayPal via PayByCash was refused in January 2005 as shown in the revenue drop. Another notable thing is that in December 2004 there was a big Christmas campaign which increased especially credit card revenue because of a fairly big Canadian customer base.

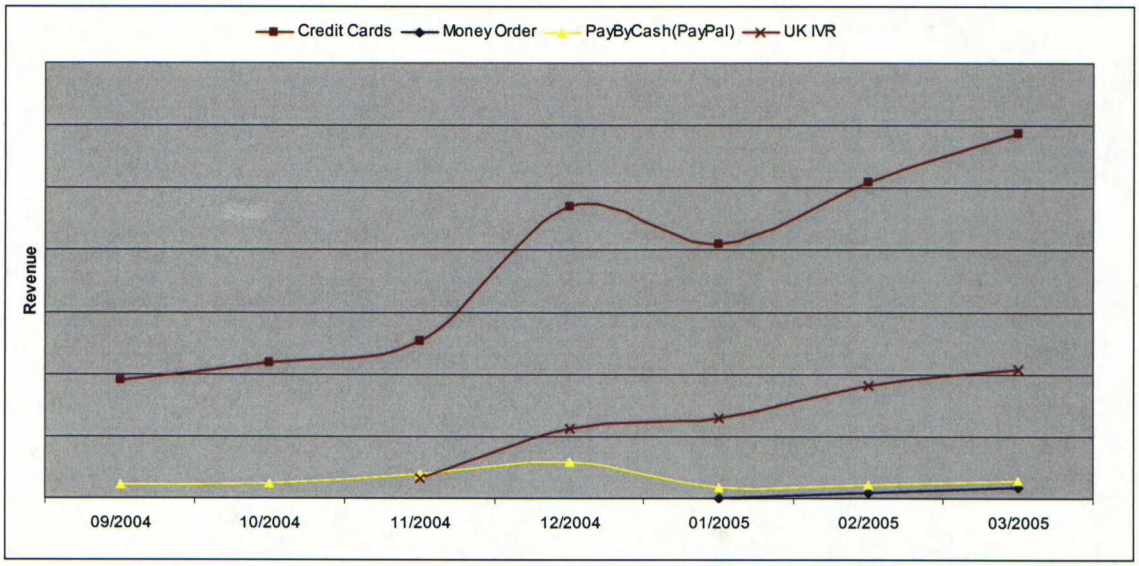

Figure 18: Actual revenue development during the last year per payment method

It seems these figures follow our assumptions. UK users, 20 percent of the total users, make a bit over 20% of total revenue through an effective and easy to use IVR system. This is a good result because there is £25 weekly limit for UK IVR. For Canadian, US and other users, credit card is the primary method. That is why almost 80 percent of the total revenue comes from credit cards. Currently average credit card purchase is 12 Euros per transaction.

There are other methods in the system but their value is much smaller as illustrated above. So when we compare the payment evaluation chart to revenue and profit share chart we can see a clear correlation if we keep in mind the share of users per country and their possibility to use existing payment system. There are no cultural or legal issues which would conflict with this behavior.

8.1.4 Habbo Hotel United Kingdom

The secondly Habbo Hotel launched was in the UK in January, 2001. It currently has slighlt more than 400 000 monthly visitors. There are six main payment methods there:

- SMS for UK users
- IVR for users in UK, Belgium, Germany, Ireland, Italy and The Netherlands
- Splash Plastic, prepaid card for UK users
- Credit cards for US and Canadian users.
- Money and checks via postal money order.
- British Telecom's Click & Buy for UK users billed via credit card, debit card, online direct debit or BT home telephone bill.

Similarly to the US Hotel, habbohotel.co.uk has three dominant country specific user groups. 40 percent of registered users in Habbo Hotel UK are from United Kingdom and 20 percent from both US and Canada.

Typically in the UK for cashless payments, people use 35% payment cards, 25% checks, 20% giros and 20% direct debits. 45% of used payment cards are credit cards and like Europeans in average, 35% are willing to use it to make Internet purchases. In telecom payments IVR is popular for billing purposes. SMS is becoming more popular for contents other than ring tones and logos for mobile phones. Only 30 percent of British mobile phone users use a postpaid model for paying mobile phone bills. Below is a table describing the current payment method score table for Habbo Hotel UK. No overlapping methods exist.

Table 9: Payment method score table for Habbo Hotel UK

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
SMS	95 %	55 %	95	90	**88 %**	95 %	**0,46**
IVR	85 %	78 %	80	75	**66 %**	95 %	**0,49**
Click&buy	90 %	87 %	75	70	**65 %**	80 %	**0,45**
Prepaid Card	100 %	85 %	30	60	**45 %**	99 %	**0,38**
Money Transfer	100 %	100 %	0	10	**5 %**	99 %	**0,05**
US credit card	75 %	90 %	75	35	**41 %**	95 %	**0,35**
Tot.					**310 %**		**2,18**

We can now design a payment method evaluation chart for Habbo Hotel UK, which is illustrated below.

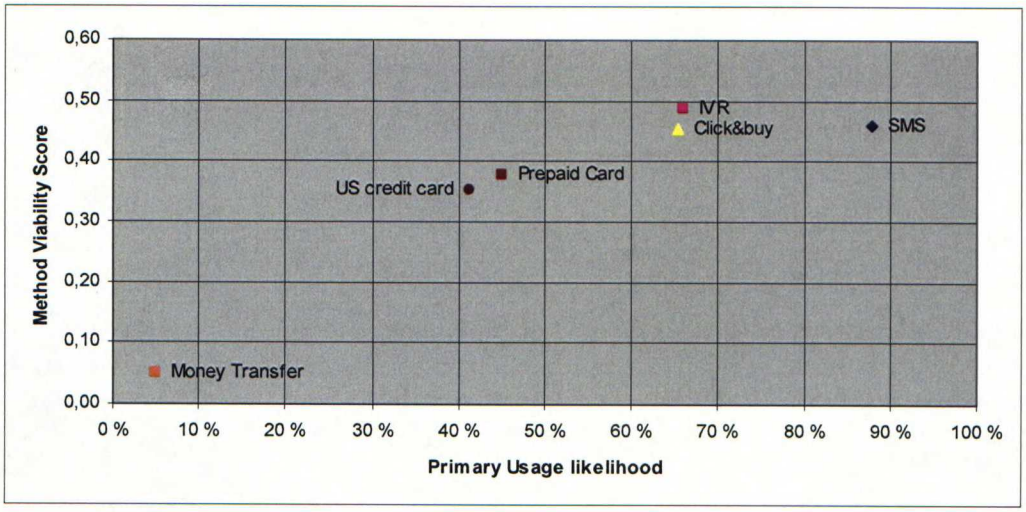

Figure 19: Payment method evaluation chart

Here we see users are very likely to use SMS, IVR and BT Click&buy payment methods to buy Habbo Hotel Credits. Credit cards are mainly targeted towards US and Canadian customers. Prepaid cards are quite good also according to this chart. Below is a chart illustrating actual monthly revenue and profit shares from Habbo Hotel UK.

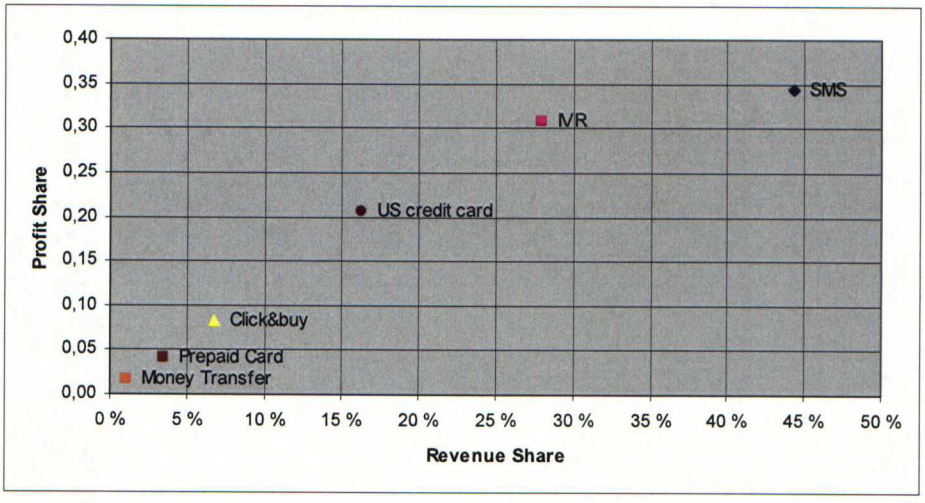

Figure 20: Actual revenue and profit shares per payment method

Below is another chart illustrating actual monthly revenues from Habbo Hotel UK. Here revenue development during the recent year can be seen per payment method. There are three notable changes during this time. In September 2004 there was a big prepaid card

campaign which increased its revenue but did not affect much on other methods revenues, which ones again validates the concept of having different buying behaviors in payment method mix. Another interesting thing is how technical improvements in November 2004 for SMS affected its revenue development curve. Similarly, US credit card revenue has been going up and down. The first drop in August 2004 occurred when US customers received their own .COM Hotel and migrated away from the UK Hotel. The second revenue boost for credit cards started in December 2004 via a special Christmas promotion.

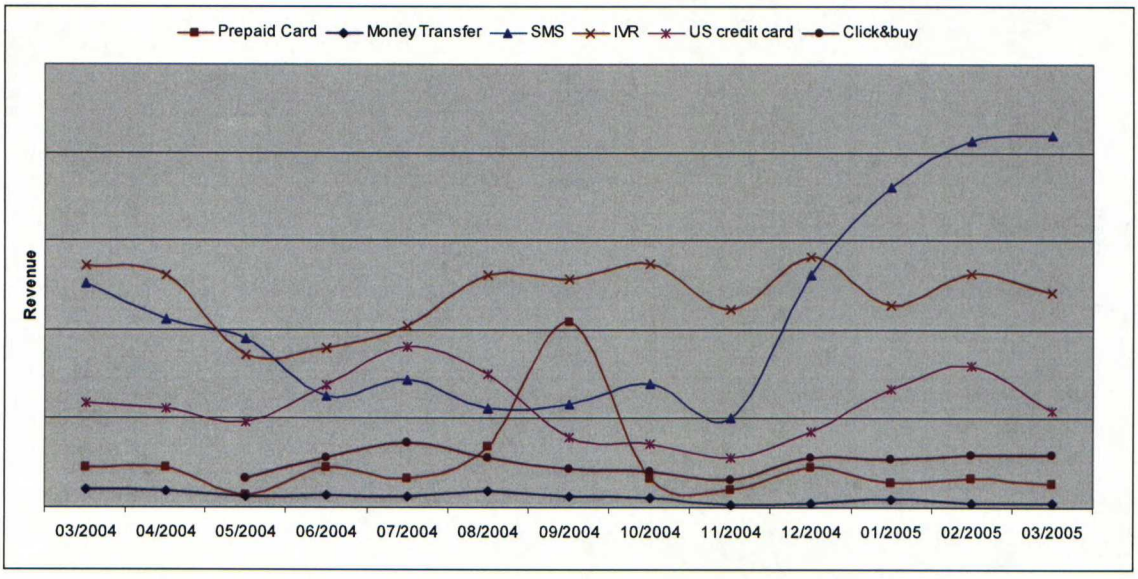

Figure 21: Actual revenue development during the last year per payment method

In the United Kingdom telecom payment methods are very popular payment methods among teenagers. A £60 weekly limit per mobile phone number for SMS payments does not adversely impact sales. IVR does not even have weekly limits in the UK. Furthermore, the primary usage likelihood for the UK users only is 270%. This is good from a users' point of view but has a negative effect on less popular methods in terms of revenue share percentage.

The only real online payment method, BT Click&buy, differs in terms of the actual revenue share even though it contains a variety of payment options and the ability to bill purchases to a British Telecom phone bill. This is so young people do not want to use their parents' credit or debit cards if it is possible to use telecom payments.

Also, adding a purchase to a phone bill appears more complicated than directly using SMS or IVR services. So to does a prepaid card differ in its ability to generate as much revenue as appears in the evaluation framework. This is because 70 percent of mobile phone users use a prepaid model. It is more sensible to use money to top up mobile phone prepaid card than any less-useable external card for other services and even weekly a limit doesn't reduce average SMS usage whatsoever.

An interesting aspect of the UK Habbo Hotel payment system is that telecom payments have been extremely successful revenue makers. Even if there are several IVR lines for different countries, 96% of the IVR revenue still comes from UK. This may mislead the analysis a bit because Click&buy and prepaid cards in the UK are not poor revenue sources. For example, Click&buy makes almost as much total profit as the most popular Finnish method, SMS, even though its profit share percentage is below 10 in a chart.

When there are a similar amount of Canadian and US users in the Habbo Hotel UK, over 80% of credit card purchases comes from USA. When this occurs US users make most, 33% of money order revenue when UK users' share is 31% and Canadian 24%.

8.1.5 Habbo Hotel Germany

Habbo Hotel Germany was opened in March, 2004 and has circa 90 000 monthly visitors. There are three main payment methods in Habbo Hotel Germany:

- SMS
- IVR
- T-Online for online billing via landline phone bill

Statistically 78 percent of registered users in habbohotel.de are from Germany. All payment methods are targeted at German customers. For cashless payments Germans typically use only 10% payment cards, 5% checks, 45% giros and 40% direct debits. 65% of payment cards are debit cards in Germany. So compared to the average European, only 36% are willing to use credit cards in Internet, credit card usage in practice is quite low. Actually Habbo Hotel Germany has an offline giro payment option but is omitted here because of lack of revenue information. From telecom payment methods IVR is not widely used for billing purposes but SMS is becoming more popular than in the rest of Europe.

Half of the Germans use prepaid model for paying mobile phone bills. Below is a table describing the payment method score table for Habbo Hotel Germany.

Table 10: Payment method score table for Habbo Hotel Germany

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
SMS	95 %	56 %	95	85	**86 %**	95 %	**0,45**
IVR	90 %	65 %	80	75	**70 %**	95 %	**0,43**
T-online	80 %	97 %	75	80	**62 %**	99 %	**0,60**
Tot.					**217 %**		**1,48**

Based on the above scoreboard's primary usage likelihood and method viability score values we can now make a payment method evaluation chart for Habbo Hotel Germany. It is illustrated below.

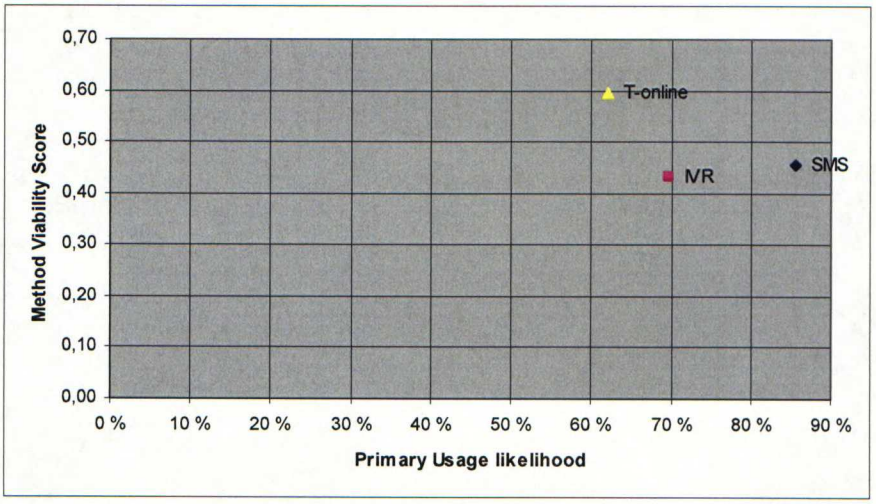

Figure 22: Payment method evaluation chart

In this chart we see users are very likely to use all of the methods for buying Habbo Hotel Credits, SMS being most likely one. In this case merchant's benefit is greatest with T-Online's billing method because of low commissions. Below is a chart illustrating actual monthly revenue and profit shares from Habbo Hotel Germany.

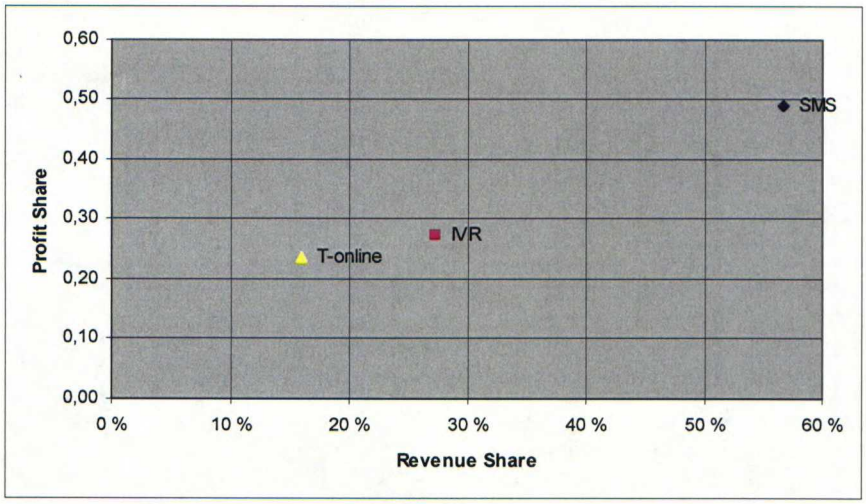

Figure 23: Actual revenue and profit shares per payment method

Next we can see a chart illustrating actual monthly revenue development per payment method in Habbo Hotel Germany during recent year. There are two notable simultaneous changes in October 2004. The set of T-Online's payment method weekly limits similar to SMS and IVR, which reduce fraudulent usage and parental complains of huge broadband bills. Another change was to accept other SMS operators than T-Mobile. These affected, in case of T-Online, a huge drop in revenue and in case of SMS, continuous increase in revenue.

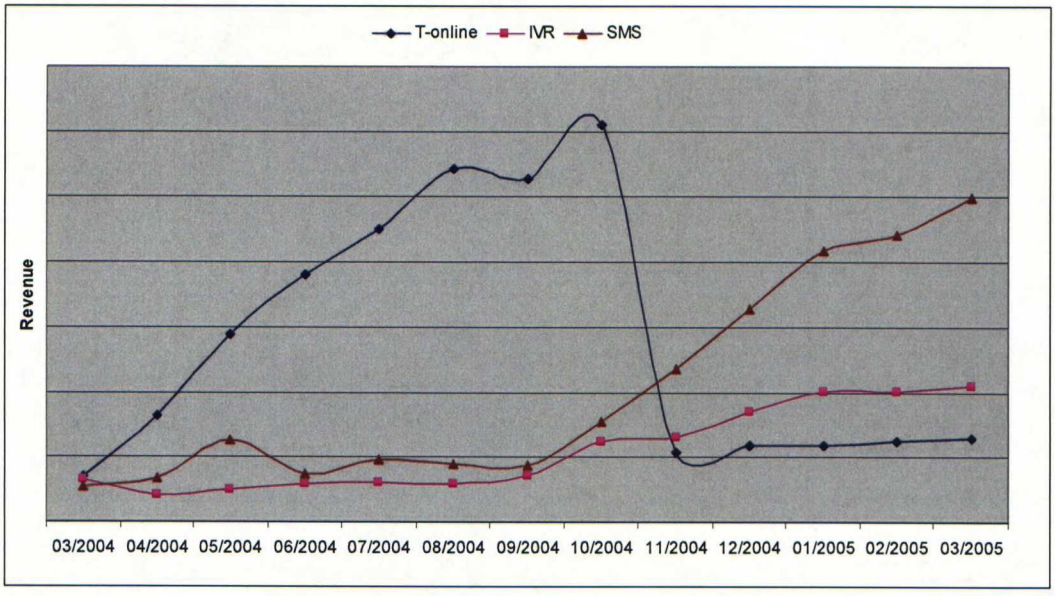

Figure 24: Actual revenue development during the last year per payment method

SMS is a very popular payment method among teenagers in Germany even though there is a €10 weekly limit per mobile phone number for SMS payments. The same weekly limit applies for IVR and T-Online's method as well. Because T-Online is a macro level payment method and is very limited even if it is viewed as an online method it leads to poor performance after usage limitation. IVR and T-Online's online payment creates an equal amount of revenue together compared to SMS alone.

SMS billing in Germany is a slightly different than everywhere else due to legal issues. The SMS billing model is actually modified subscription based model where the user first activates the service with one message and after that the message is sent and charged in common European style. This adds complexity to the system for new users but in practice doesn't influence buying behavior significantly.

8.1.6 Summary and Conclusion of Country Cases

In the previously described country cases we saw characteristics of how this payment system evaluation framework actually works in reality. The most important characteristic is that the overall framework corresponds very well with the actual users' buying behavior and systems' ability to make profit. Also, many coherent behaviors can be detected to understand the dynamics behind different payment methods. Where available, telecom payments, both SMS and IVR billing, dominate in all countries, in this age and target group. SMS billing works slightly better than IVR in all European countries because it is a easier to use, more popular among teenagers overall and does not require a certain fixed location for the payment transaction. Furthermore, limiting telecom payment transaction amounts on a weekly basis does not harm the business if the limit is set well. Actually, many chargeback and fraud issues can be reduced by setting good periodical spending limits. The USA has been a problematic country for telecom billing both culturally and technically. However, currently some major changes to improve this are happening on that side too.

Where available, the online methods of credit card and e-banking are equally effective and are usually more popular than other online payment methods. Users are willing to use culturally established online payment methods which already have established customer relationships. Cooperation with payment partners or banks usually results in good and

useful payment systems for online markets. Bundling many smaller, less-popular payment methods under one umbrella usually does not work well for big volumes.

Offline prepaid cards can be very successful if the delivery chain is properly selected. In Finland, offline prepaid cards constitute over 45% of the total profit of payment transactions. However, if SMS payment methods exist in a country, most of the SMS users should also use a post pay model for paying a mobile bill. For example, in the UK where 70% of the users use the prepaid model of paying mobile bills, less than 5% of revenue comes from prepaid cards. This is mainly because prepaid cards and prepaid mobile billing compete for users' cash valued pocket money and investing on topping up mobile phone usually makes more sense to many users.

Below is a summary of sample country payment systems' primary usage likelihood and viability values. There are also actual values for paying percentage of visitors and average revenue per paying user (ARPU). For likelihood and viability values in US and UK, only method values related to that country currently working are counted.

Table 11: Payment system score table of selected Habbo Hotels

Country	Primary usage likelihood	Viability	Paying %	ARPU
Finland	**252 %**	**1,62**	**12 %**	**13 EUR**
Sweden	**101 %**	**0,66**	**9,5 %**	**11 EUR**
USA	**61 %**	**0,49**	**1,5 %**	**6 EUR**
United Kingdom	**269 %**	**1,83**	**8,5 %**	**9 EUR**
Germany	**217 %**	**1,48**	**8,5 %**	**10 EUR**

The Table illustrates clearly how the low likelihood value impacts paying percentage. This is why the primary usage likelihood percentage should exceed 100% in order to make good revenue. That provides the average user with the possibility to pay with at least one method, if desired, which is currently not the case with credit card oriented USA. As mentioned before, the average credit card transaction in USA is approximately €12. However, these transactions happen seldomly based on the ARPU value of USA. Furthermore, an underperforming payment system leads to a reduction in end user prices to increase buying percentage which seems to lead to a relatively lover ARPU as in the USA. Telecom payments in general seem to lead to much better paying percentages and better ARPU in this target group than credit cards can currently generate.

9 Finding the Optimal Payment System

Finding an optimal payment system is a complex task and is always influenced by issues which cannot be estimated. The definition of an optimal payment system is also contingent on too many variables and instances. Even if the system would be optimal, there is always something to improve. However, it is possible to frame a procedure to find a combination that is close to the optimal payment system. With this we shall make a new payment system for Habbo Hotel .COM and determine if it meets the requirements of an "optimal" system.

9.1 Requirements for Finding Optimal Payment System

First, we need to define exactly how individual payment methods are selected for optimal payment systems based on what we have learned from country cases.

- The first requirement is to have enough method options to choose from. Besides pure online payments, telecom and offline payment methods should also be considered.
- There also exists a need to understand target groups' special needs when they are making payment transactions and if there are other persons involved in the payment process.
- In micro level payments, setting end user pricing of the single product is relatively easy while it is more difficult to find good payment method options. Different types of product or transaction bundling models widen this space.
- System should provide both micro and macro level payments cost effectively.
- Making payment method evaluation framework of all methods.
- Selecting the combination of best methods so that:
    1. It meets the above requirements
    2. Gives the best possible system viability value
    3. There should be 1 to 3 methods per payment category (telecom, online, offline)
    4. Every category's likelihood is close to 100%
    5. Limiting the total amount of methods to 5 to 6
    6. Every user should have at least one suitable payment method available.

- Evaluate selected system's methods cross compatibility and overlapping functionality. Prepaid cards do not perform well if the majority of mobile users use the prepaid model to top up their phone.
- If a system's total likelihood value is over 100%, there usually will be one dominant method in terms of revenue. If that number is 200% there will be two and so on. Dominant methods are typically the ones that have the best likelihood value. In all cases where there exist dominant payment methods, other payment methods do not perform that well.

9.2 Optimal Payment System for USA

To find an optimal payment system for Habbo Hotel USA we will use the above ruling framework. This ruling is intended to be iterative in nature. No exact optimization calculations can easily be made. This payment system is targeted to US users only for simplifying the process. Canadian users may still use credit cards and UK users their IVR line in a new system.

There are currently several problems in the US billing system. For example, lack of diversity of methods, low usage likelihood percentage, low paying percentage, low APRU, no viable access to users' pocket money and so on. In this new system we want to address these current problems. Below is a table showing the result of selecting the best suited methods for US markets. Each method's values are based upon a method evaluation framework.

Table 12: Planned payment system for Habbo Hotel USA

Method	Target group coverage	Revenue share	Response time	Usability	Primary usage likelihood	Risk	Viability
SMS	49 %	49 %	90	80	**42 %**	95 %	**0,19**
IVR	75 %	49 %	80	75	**58 %**	95 %	**0,27**
Credit Cards	85 %	90 %	75	35	**47 %**	99 %	**0,42**
Click&Buy	75 %	70 %	70	45	**43 %**	90 %	**0,27**
Prepaid Card	80 %	70 %	50	90	**56 %**	99 %	**0,39**
Money Order	100 %	100 %	0	10	**5 %**	99 %	**0,05**
Total					**251 %**		**1,59**

These methods were selected so that telecom payments create volume, online payments generate high profits and offline payments provide a prepaid model to the system. The overall total system performance shall be at the same level as it is in the UK or Finland.

While micro level premium rated SMS billing has been very successful in Europe, Australia and some other parts of Asia, in the USA SMS billing is a new thing and suffers low revenue shares, target group coverage, technical interoperability and some cultural issues. Legally, SMS billing flow for telecom operators must be a double flow, which means that when users send a message to the service, the service sends a confirmation message back which must be confirmed with another SMS message. A similar model is used in Finland for above €5 SMS. This adds extra fat to the operators' revenue share. Also, some major mobile operators like T-Mobile and Verizon do not currently accept mobile billing for external services but only for mobile content. So in order to make this work, some workaround must to be developed.

Another issue in SMS billing is target group coverage which is poor due to operators' lack of cooperation. Also, technical interoperability lowers the target group coverage a bit. That is why it is impossible to achieve high likelihood and viability values in the USA as in Finland and Sweden. Only one price category should obtained for SMS as this makes the system easier to use and technically simpler. Operator commissions vary based on pricing. And the cheapest possible prices should be used. Actually there is only two countries currently, Finland and UK, that allow over €5 SMS billing options.

IVR is another successful telecom payment method. Surprisingly, based on this evaluation it is better than SMS for USA. IVR suffers from a lack of cooperation with traditional telecom operators in handling country wide landline telecom services. There are lots of local small operators that do not work well with big operators. Also, the power of big operators and the requirement for serving the whole country leads to a situation where commissions for these kind of services can be much higher than for in Europe for example. IVR billing is becoming more and more popular in the USA and other big players like Amazon.com[22] have recognized the possibility to access high volume markets this

[22] Amazon.com, 2005

way, especially in USA. However, when combining above tables SMS and IVR likelihood percentages, it reaches to 100.

The credit card method here is viewed as the primary online macro level payment method. It is basically the same service as in the old system with some changes. The credit card method here is intended to be improved to reduce chargeback percentages and in this way the method's risk can be reduced from 95% to 99%. Also, one new credit card option is added to increase target group coverage from 75% to 85%. These should bring up to 15% increases in revenue.

Click&Buy is a secondary online payment method for USA. It is a similar method as in the UK but in US it is currently unable to bill charges to phone bill. In its place they offer convenient monthly payment through direct debit, credit card, invoice or prepaid account. This first appears overlapping with the existing credit card system, but no credit card numbers or other information than a username and password is required during the transaction. So credit card is used only for topping up the electronic purse and in this way it differs from actual credit card payments. It is also a worthwhile option for consideration because of other payment options and its current usage figures. More than 3 million consumers are already making payments using the system. Together, credit cards and Click&buy have a usage likelihood value of 90%. This is quite good for online payments, and actually the same as in Finland.

Point of sale activated prepaid cards was also selected for this system because most of the mobile phone users are using a post pay model which does not pose a conflict. Also, these cards have been shown to be very successful in the Finnish market. The only problem here is to find a good delivery chain that can provide over 80 % coverage in the USA, which is the target coverage here. Cards will be priced from $5 to $50, so they are a both micro and macro payments. Point of sale activated cards is becoming more and more popular in the USA. Indeed, big players such as iTunes, Gamespy[23] and Napster[24] have recognized the possibility to access young users' pocket money this way.

[23] Gamespy, 2005
[24] Napster, 2005

Traditional money orders were selected for this system to provide a payment option for people who cannot use any other method. Money orders are available in every postal office in USA, various retailers such as Walmart which makes for extremely good coverage. The obvious downside of this method is that it may take weeks post-transaction before a user gets his or her Habbo Credits for the game. Together prepaid cards and money orders have a 60% usage likelihood value for offline electronic payments.

Below is a chart illustrating on how the new system looks in a payment method evaluation chart. Because our primary usage likelihood percentage is over 250, there will be credit cards, prepaid cards and IVR dominating the new system. Click&buy, SMS and money orders are all secondary options for these methods and are not that successful. Nonetheless, they still have a function and a reason to be part of the overall system.

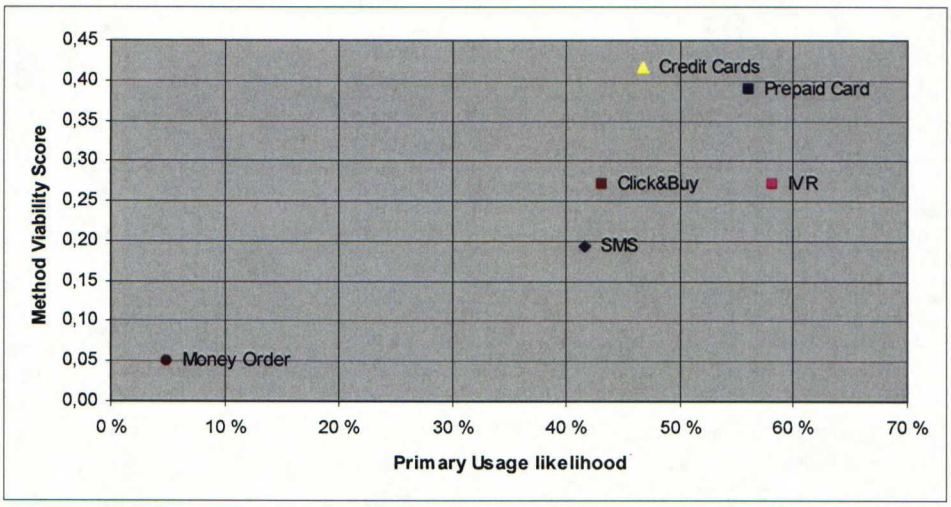

Figure 25: New Payment System for Habbo Hotel USA

When we look at the total primary usage likelihood value and viability score value in old and new payment system, we see a clear increase in both. The values for the old system do not contain the previously illustrated UK IVR or PayPal values. There is actually a 411% increase in the likelihood value and a 325% increase in the viability score. Below is a chart that illustrates this remarkable change.

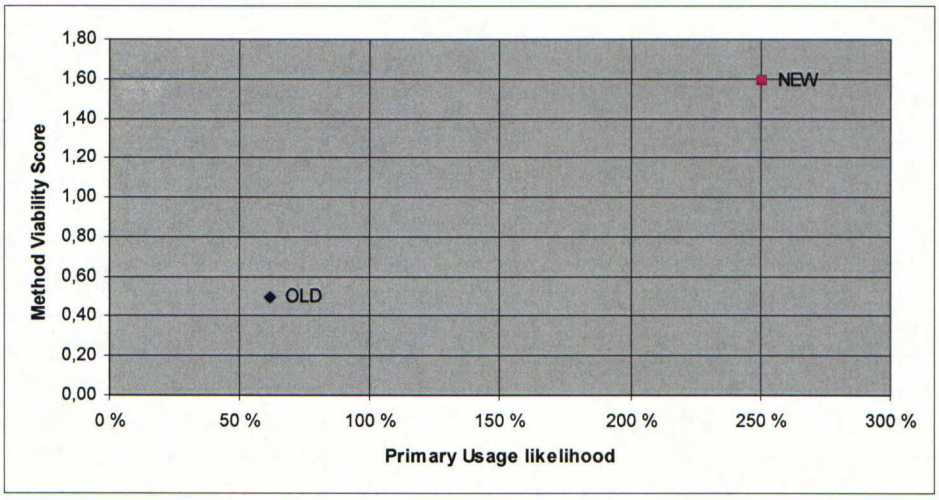

Figure 26: Comparison of old and new evaluation frameworks

In theory this seems to be an impressive improvement and the new system is probably very close to being an optimal payment system for this environment as it has similar values as Habbo Hotel Finland, which is much easier country to deal with.

To see how well this actually applies to the real world we need to know how users really use this service and how revenue is shared among different methods. Because these methods have just been launched and some methods work only partially, we need to make a best possible estimation of future revenue shares. This, however, does not mean that we need to estimate actual revenue or profit. We just need to estimate how it will be divided among different methods. In other words, all revenue values for every method are based on early stage and previous experience in that market and are linearly counted to meet the target situation. For example, if we have IVR working in some US States but only 10% country coverage, we can quite well estimate what the actual revenue share will be for 80% country coverage. Of course, this not an exactly accurate way as some users start using different methods as they become available later and correspondingly the revenue share of the previously used method decreases a bit. Below is a chart representing estimated revenue shares based on estimation calculations.

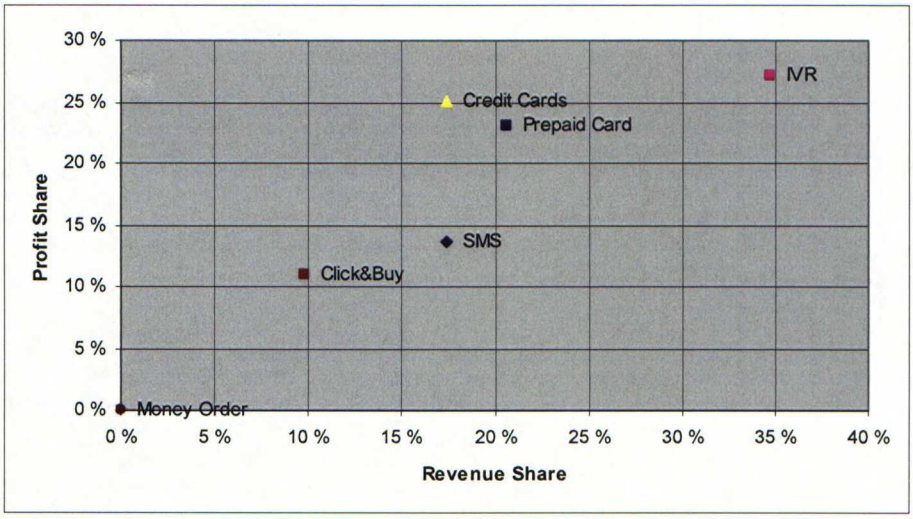

Figure 27: Revenue and profit shares of new US Payment System

If we compare this to our method evaluation framework, we see that this follows our assumptions quite well. The only difference is that IVR has a greater share of revenue than appeared in the evaluation chart. This is probably due to the fact that American culture has been predominantly telephone-oriented as almost everything has been accessible via phone. So this is not actually such a new service for users even if pure IVR billing is quite new as a concept. The specific thing currently for US telecom billing, especially for SMS, is that the user needs to be promoted and educated to actually learn to use the system. Otherwise SMS will never be a success story.

If we assume that old system's two methods, credit cards and money orders, continue have same revenue than currently, we can also estimate total revenue of the whole system, by seeing the revenue difference between the old and the new system. Below is a chart that represents that difference.

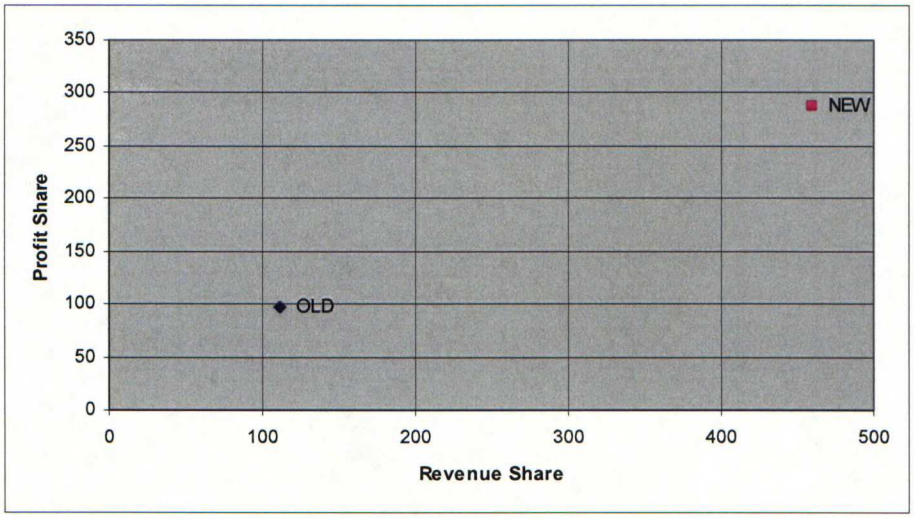

Figure 28: Revenue and profit in old and new payment system

Now we can see that revenue increase is expected to be 418 percent and total profit increase for the merchant almost 300 percent. Correlating values for evaluation framework difference were 411% and 325%. This result falls into a 10 percent error marginal estimated in chapter 7. Of course, measuring revenue is always problematic because it follows products lifecycle. And during the cycle there is a phase of revenue growth and a phase of revenue decline. So many revenue assumptions and estimations are simplified and mended to merely show the actual frameworks' accuracy and ability to be used as a strategic tool when planning real payment systems. It is also difficult to say if this new system is really optimal but at least we can opine that it is close to optimal in this case and environment contingent upon all payment system evaluation framework requirements being met.

9.3 Summary of Finding Optimal Payment System for Habbo Hotel USA

In this chapter we have assessed how to find an optimal payment system for network gaming in a specific country. There are certain rules and criterion to be met in order to find the system that is easy to use and profitable. Both are vital because they correlate each other. Many merchants only focus on the commissions of the single method or simply rely on one established reliable method such as credit cards. However, we have shown that a wider method set can lead to substantially better financial results both in terms of revenue and profit.

10 Discussion

Electronic payment systems for network gaming have evolved in many directions but established cultural habits are still in present and will exist for a long time. In the area of very small amount micro payments it is unlikely there shall be a new cost effective payment systems very soon. It can be seen that small or merchants-owned payment systems seldom take off due to lack of customers. An exception to this is eBay's PayPal payment system that combines most used online payment methods under one brand. In actuality, most of the payments in PayPal are actually made directly or indirectly with credit card so there is not much new in this system. Methods for non cashless point of sale payments and other big money transfers, like wages, also impact the variety and quality of available online payment methods in a country. Similarly, daily usage of credit cards for everyday purchases increases frequency of use online. Also if checks are commonly employed everyday, it is more likely that there are undeveloped systems for e-banking type of payment methods.

The payment business is characterized by established roles following well-defined technical architectures. In telecom payments, single companies more eagerly assume control over several roles, even the whole value network in some cases. There currently exists a significant need for telecom operators generate more revenue and expand to new business models. This has produced a situation where commissions for telecom payments have significantly raised to even a higher price range. The total transaction costs, operator commission, in Finland for one 20 Euro SMS is about 6 Euros or one third the end user price. The transaction cost for a single 20 Euro credit card purchase would be below one Euro. This keeps credit card payments popular in the realm of micro payments even though SMS based telecom payment are better in all ways for many cases.

There was shown in previous chapters how payment methods and systems can be evaluated and how this methodology can be used for strategic planning on locating optimal payment methods. Many issues continue to impact real revenue results other than those explained directly in the evaluation framework or optimal system ruling. So in the majority of cases luck and other issues effect on success of payment system in practice. Nonetheless, from a payment systems point of view, it is possible to define a system close to optimal by selecting the best from existing payment options. This payment system

evaluation method is broad enough to suit many other cases than Habbo Hotel given that five different country cases were defined and generated similar results. It can therefore be concluded that this method is applicable to other non-Habbo network gaming services.

There was a time when almost all network gaming services employed a subscription based credit card payment model. This was simple to do and suitable for some target groups and resulted better profit than transaction based credit card purchases. But currently big US players like iTunes, GameSpy, Napster, Amazon.com are using transaction based model and expanding their methods to telecom and prepaid cards to expand payment options for their target groups. Today there are only a few large successful players using only subscription model in the network gaming and music industry. This is largely because of the much greater volume access where no subscription is required to use the service. Subscription based services are suitable for newspapers and similar services which generate new content every day and has low trend value for its users. However, there are no results demonstrating is it superior to the "pay as you go" model. In Network gaming, users normally do not want to be tied into one game for very long period of time which is why transaction based model applies best here.

So to define the future trend for payment systems in network gaming and similar services, it is easy to see that having different viable options for payments to cover the real target group's needs are a key future success factor. This effect can be seen in case of Habbo hotel US, where the payment system performance increased four hundred percent compared to the old one simply by virtue of a good mix of methods instead of only providing the first method that comes in a mind.

11 Conclusions

11.1 Results

Here are the concrete results founded from this study listed:

- A micro payment scheme can be made workable and profitable for network games, whether it is a transaction based or more traditional subscription based model, but this requires that the concept of a game is designed also from that point of view.
- The Internet purchase behavior is always a mix of existing purchase behavior, set by surrounding culture, and a more global Internet purchase behavior, set by other cultures. If users in some country are used to use some payment method in a real world, its use in the Internet can be relatively low. Similarly this can happen also in opposite way. So, the Internet is changing purchase behavior of customers to more global direction when buying from Internet, but also in a real world.
- If there are several competing methods for buying single product or service over the internet, the purchase is made based on method's availability to user, usability and response time. These are similarly the main characteristics for estimating usage and popularity of the method for the Internet purchases and were used as a basis of the payment system evaluation framework developed for this study.
- The payment system evaluation framework may be used for planning and evaluating payment systems for transaction based online gaming and other similar services. The framework illustrates how good and viable the system is not only from a user's point of view, but also from a merchant's point of view. This was done by including common transaction commissions and business risks to a merchant into a framework. Several case studies, where this framework was allied, showed well that this framework can be used for modeling revenue and profit shares in total and per payment method based on selection of methods in use.
- The roles in different payment method architectures, suitable for a network gaming and the context of this study, are fairly similar throughout the global scale and are currently quite stabile in nature. That is why it is hard to find alternative architectures or bypass roles to have easy cost savings on transaction costs.
- The near future of electronic payment for network gaming systems will still be divided to subscription based and transaction based models and in both micro and macro level. These models are more and more divided into three categories:

Telecom payments, online payments and offline payments. Every category has it's strengths and weaknesses, and none will disappear from this mix. Offline methods are seen to be much more used than they currently are. Traditional subscription based model is mostly seen to be a secondary option and reserved for additional "membership services" for Internet services like network games. In this type of games majority of users are young and relatively trend oriented and that way reluctant to be committed to use one service for a longer period of time. Currently the only viable global payment method for easy-to-use subscription based services is a credit card, which can be a problematic option for users under 18. That is why the future of mass market network gaming will be more heavily based on transaction based "pay as you go" -model.

11.2 Relevance and Reliability

For the company this study was made, the core, a payment method evaluating framework, has become an important part of decision making of what different payment methods implemented and what order. Because of the quantitative nature of this framework, it enables also historical tracking of the system which has resulted better decision making process and overall financial results. This is why this framework is currently widely recognized in the company and is seen as competitive advance when building global payment systems to existing and new countries.

The reliability of this framework was mainly proven by showing different real world cases of payment systems of the the Habbo Hotel in five different countries. These cases were randomly selected and presented situations from different times of evolution of the product. The total quantitative accuracy of the framework depends more on other methods used during the evaluation. Purely quantitative basic parameters are "Target group coverage", "Revenue share" and "Response time". But less easily evaluated parameters, "Usability" and "Risk", are relying on methodology, accuracy and context of the methods used. So the reliability can be only good and viable if similarly made evaluations are compared with each others.

11.3 Exploitation

This method of evaluating payment systems is broad enough to suit many other cases than Habbo Hotel given that five different country cases were defined and generated similar results. It can therefore be concluded that this method is applicable at least to other

non-Habbo network gaming services. The analysis tool for evaluating revenue impact of an additional telecom or offline payment method can help most of the companies, operating in the Internet business, to understand potential of their business much better and more accurate than earlier.

11.4 Further Studies

The primary subject for future study in this area is to find a model illustrating how the impact of pricing affects a payment system's ability to generate revenue. It would also be useful to study more deeply how the subscription model differs from the transaction based model, advantages and disadvantages of both methods, where they work better and possible options to combine them successfully. Finally, analyzing and uncovering how limiting telecommunication billing for this target group effects to actual revenue be intriguing.

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